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AEROSPACE MEDICINE AND BIOLOGY

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during November, 1964.



Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. DECEMBER 1964

INTRODUCTION

SP-7011 (05) is the sixth issue of *Aerospace Medicine and Biology*, NASA's continuing bibliography for the abstracting and announcement of current references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project (AMBBP) of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics, and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, SP-7011.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry in SP-7011 (05) consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

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- b. AIAA entries identified by their *IAA* accession numbers (A64-10000 series); and
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(continued)

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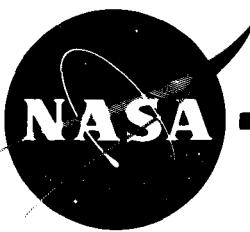
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Other organizations can purchase copies of the bibliography from the Office of Technical Services, U.S. Department of Commerce.

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AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography

DECEMBER 1964

STAR ENTRIES

N64-27889 Naval School of Aviation Medicine, Pensacola, Fla.

VISUAL CONTROL OF HABITUATION TO COMPLEX VESTIBULAR STIMULATION IN MAN

Fred E. Guedry, Jr. 5 May 1964 19 p refs
(NASA Order R-93)

(NASA-CR-56896; Rept.-95) OTS: \$1.60 ph

Twenty men completed an experiment in a slow rotation room while it rotated for several hours at a rate of 45° sec. Subjects were immobile (relative to the room) except for habituation series that consisted of head movements restricted to one plane and to a particular quadrant of that plane. Visual problems were presented with each head movement to one group of subjects; another group made all head movements of the habituation series in darkness. Tests conducted in darkness before and after the habituation series revealed pronounced reductions in nystagmus and subjective effects in the practiced quadrant only in the visual-task group. The other group showed no reduction of nystagmus in either the practiced or unpracticed quadrant. This experiment indicates that vision can be an important factor in habituation of human subjects to vestibular stimulation.

Author

N64-27890 Naval School of Aviation Medicine, Pensacola, Fla. Naval Aviation Medical Center

INFLUENCE OF STRONG MAGNETIC FIELDS ON THE ELECTROCARDIOGRAM OF SQUIRREL MONKEYS (*SAI-MIRI SCIUREUS*)

Dietkich E. Beischer and James C. Knepton, Jr. 13 Mar. 1964 26 p refs
(NASA Order R-39)

(NASA-CR-56886; BUMED-8) OTS: \$2.60 ph

Man may be exposed to strong magnetic fields over prolonged periods of time if plans to apply such fields for reasons of a technical nature in future spaceships are realized. Experiments with subhuman primates are necessary in preparation for systematic investigation of possible effects of such fields on man. A study of the performance of the heart in a strong magnetic field is of special interest. Electrocardiograms of four monkeys were recorded during exposure of the animals to magnetic fields of 20,000 to 70,000 gauss. Neither breathing rate nor R wave amplitude of the ECG was affected. A decrease in the heart rate, an increase in the degree of sinus

arrhythmia, and a considerable augmentation of the amplitude of the T wave are newly observed biomagnetic effects. The influence of strong magnetic fields on electrical processes in living matter is stressed.

Author

N64-27891 Naval School of Aviation Medicine, Pensacola, Fla. Naval Aviation Medical Center

USE OF CALORIC TEST IN EVALUATING THE EFFECTS OF GRAVITY ON CUPULA DISPLACEMENT

Michael E. Mc Leod and Manning J. Correia 2 Apr. 1964 14 p refs

(NASA Order R-93)

(NASA-CR-56791; BUMED-94) OTS: \$1.60 ph

This study was carried out to evaluate the effect of gravity on cupula displacement. The results do not support the hypothesis that the cupula responds to linear acceleration (gravity) if it is assumed that the cupula is heavier than the surrounding endolymph.

Author

N64-27946 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A STUDY OF THE PILOT'S ABILITY TO CONTROL AN APOLLO TYPE VEHICLE DURING ATMOSPHERE ENTRY

Rodney C. Wingrove, Glen W. Stinnett, and Robert C. Innis Washington, NASA, Aug. 1964 49 p refs
(NASA-TN-D-2467) OTS: \$1.25

Studies have been conducted on the manual control during entry of a space vehicle into the earth's atmosphere at parabolic velocities. These studies were conducted on a centrifuge where the pilot experienced the acceleration forces associated with the simulated flight. The pilot tasks in this study included (1) control to various acceleration levels, (2) control of range with various displays and various modes of short-period stability augmentation, and (3) monitoring and recovery procedures.

Author

N64-27953 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

PATHOPHYSIOLOGY OF PULMONIC TOXICITY IN RATS EXPOSED TO 100 PER CENT OXYGEN AT REDUCED PRESSURES

Kenneth H. Dickerson 5 May 1964 85 p refs
(NADC-ML-6403; AD-601331)

A life support system for exposing experimental animals to artificial atmospheres is described. This system was used to subject mature, male, Caesarean-delivered, albino rats to essentially 100% oxygen at pressures of 725-, 650-, 550-, and 250-mm Hg. The environmental variables of temperature, pressure, relative humidity, P_{CO_2} , and P_{O_2} were controlled within certain desired limits. The purpose of the oxygen exposures was to determine the hazard to rats of breathing pure oxygen at pressures of less than one atmosphere, for prolonged

time periods. After exposure the dead and surviving animals were examined grossly and microscopically for pulmonary damage. The survival time of rats appears to be inversely related to the oxygen partial pressure. Their survival time begins to be appreciably lengthened at a pressure lying somewhere between 550- and 650-mm Hg. Author

N64-27954 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

OBSERVATIONS ON ACUTE AND CHRONIC OXYGEN POISONING

George H. Kydd 21 Apr. 1964 15 p refs
(NADC-MA-6331; AD-600773)

In an effort to discover the relationship between the occurrence of convulsions (acute effects) caused by oxygen at high pressure (OHP), and paralysis (chronic effects), susceptible rats were repeatedly exposed to OHP under conditions that lessened the tendency toward the occurrence of convulsions. One group was lightly anaesthetized (10 mg/kg Nembutal), and the other was exposed for a short time to maximum pressure, then slowly decompressed. Of the anaesthetized animals, two developed paralysis without having exhibited any previous acute (convulsive) effects, while four developed paralysis with only slight acute effects. All of the slowly decompressed rats convulsed but only two showed paralysis. These observations indicate that paralysis and convulsions are not necessarily associated symptoms of oxygen toxicity. Author

N64-27968 Massachusetts Inst. of Tech., Cambridge Research Lab. of Electronics

RESPONSES OF SINGLE UNITS IN THE AUDITORY CORTEX

G. L. Gerstein and N. Y-s. Kiang Repr. from Exptl. Neurol., v. 10, no. 1, Jul. 1964 p 1-18 refs
(Grants NsG-496; NSF G-16526; NIH G-MH-04737-03; NIH G-B-1344)

The temporal firing patterns of units in the auditory cortex were studied as a function of stimulus parameters. Different units exhibit a wide variety of response patterns for the same stimulus. A particular unit may exhibit different response patterns to different stimuli. Units do not seem to show laminar or columnar organization with respect to temporal response pattern. However, tonotopic organization of the cortex may be reflected in the arrangement of columns, where each column is maximally sensitive to a particular frequency. Author

N64-28007 Joint Publications Research Service, Washington, D.C.

GEOBOTANICAL MAPPING

V. B. Sochava and T. I. Isachenko, ed. 6 Jul. 1964 118 p refs
Transl. into ENGLISH of the book "Geobotanicheskoye Kartografirovaniye", Moscow, Izd. Akad. Nauk SSSR, 1963 p 3-72
(JPRS-25347; TT-64-31620) OTS: \$2.50

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1. PROSPECTS IN GEOBOTANICAL MAPPING V. B. Sochava p 1-12 refs
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8. EXPERIENCE IN THE MAPPING OF PASTURE TERRITORIES OF KAZAKHSTAN Ye. I. Bakanach p 78-82

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N64-28009 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM "NAUKA I ZHIZN" (SCIENCE AND LIFE), VOLUME XXX, NO. 2, 1964

17 Jul. 1964 183 p Transl. into ENGLISH from a RUSSIAN Periodical
(JPRS-25506; TT-64-31778) OTS: \$3.00

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N64-28034 Joint Publications Research Service, Washington, D.C.

SOVIET RESEARCH IN BIOPHYSICS

30 Jul. 1964 151 p refs Transl. into ENGLISH from Biofizika (Moscow), Vol. IX, no. 2, 1964 (JPRS-25652; TT-64-31924) OTS: \$4.00

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5. COOLING OF BLOOD SOLUTIONS OF PATIENTS WITH MALIGNANT NEOPLASMS IN A HIGH-FREQUENCY ELECTRIC FIELD V. K. Tkach p 64-78 refs

6. ELECTROPHYSIOLOGIC INVESTIGATION OF FROG OLFACTORY EPITHELIUM A. L. Byzov and G. I. Flerov p 79-96

7. COORDINATE STRUCTURE OF HUMAN BALLISTIC MOVEMENT AND QUESTIONS OF ITS CENTRAL REGULATION L. V. Chkaidze p 97-109 refs (See N64-28039 20-16)

8. ANIONS AND THE WORK OF EXCITABLE TISSUES L. M. Tsofin and Ye. A. Liberman p 110-144 (See N64-28040 20-16)

N64-28035 Joint Publications Research Service, Washington, D.C.

TAUTOMER TRANSFORMATIONS IN NUCLEIC ACID COMPONENTS AND THEIR ROLE IN MUTAGENESIS

B. I. Sukhorourov and V. I. Poltev *In its Soviet Res. in Biophys.* 30 Jul. 1964 p 1-23 (See N64-28034 20-16) OTS: \$4.00

The results of theoretical consideration between thermodynamic functions of tautomer equilibrium and quantum-chemical parameters of molecules are applied to a study of tautomer transformations of nucleic acid components and a clarification of the biological role of their tautomer structures. An appraisal of the changes of enthalpies and tautomer equilibrium constants of nitrous bases is given.

R.T.K.

N64-28036 Joint Publications Research Service, Washington, D.C.

INVESTIGATION BY VAPOR FLOW METHOD OF APPEARANCE AND DESTRUCTION OF SEMIQUINONE FREE RADICALS IN SYSTEMS MODELLING BIOLOGICAL OXIDATION

I. G. Kharitonov, A. E. Kalmanson, A. G. Chetverikov, and L. A. Blyumenfeld *In its Soviet Res. in Biophys.* 30 Jul. 1964 p 24-38 (See N64-28034 20-16) OTS: \$4.00

The following substances were investigated while forming during step-wise oxidation or restoration of semiquinone free radicals: n-benzoquinone, ethylhydroquinone, menadione (water soluble bisulfide derivative of vitamin K), methinone (water insoluble vitamin K), and flavones (rutin and quercetin). The substances were investigated by EPR and by vapor flow methods (VFM), and the results are discussed in detail.

R.T.K.

N64-28038 Joint Publications Research Service, Washington, D.C.

THE NATURE AND MECHANISM OF NEURON DISCHARGE

V. V. Dubikaytis and Yu. V. Dubikaytis *In its Soviet Res. in Biophys.* 30 Jul. 1964 p 48-63 refs (See N64-28034 20-16) OTS: \$4.00

An attempt is made to determine the mechanism of ionic exchange of K and Na and the actual nature of neuron discharge, on the bases of the calculation of peculiarities in the change of aqueous cytoplasmic structure and the properties of nucleoproteins at different functional states of the neuron.

R.T.K.

N64-28039 Joint Publications Research Service, Washington, D.C.

COORDINATE STRUCTURE OF HUMAN BALLISTIC MOVEMENT AND QUESTIONS OF ITS CENTRAL REGULATION

L. V. Chkaidze *In its Soviet Res. in Biophys.* 30 Jul. 1964 p 97-109 refs (See N64-28034 20-16) OTS: \$4.00

A review of investigations of the ballistic movements of the lower limbs and, to a lesser extent, the upper limbs of man is presented. The ballistic movements are considered those that consist of three phases—swing, blow, and post-blow braking of the kinesthetic “links” executing this movement. The first two phases are discussed since the quality of fulfillment of a ballistic movement is connected only with these phases. Evidence is presented indicating that the brain controls the flow of the basic phase of ballistic movements.

R.T.K.

N64-28040 Joint Publications Research Service, Washington, D.C.

ANIONS AND THE WORK OF EXCITABLE TISSUES

L. M. Tsوفин and Ye. A. Liberman *In its Soviet Res. in Biophys.* 30 Jul. 1964 p 110-144 (See N64-28034 20-16) OTS: \$4.00

This survey article covers the following topics that are related to the participation of anions in the function of excitable tissues: distribution of anions between cell and medium; membrane Cl⁻ distribution theory; influence of change of Cl concentration on rest potential and resistance of muscle fiber membranes; mechanism of Cl distribution as postulated by the phase-membrane theory; the role of Cl in action potential generation; and the influence of Cl ion replacement in solutions on the mechanical response of skeletal muscles. R.T.K.

N64-28050 Joint Publications Research Service, Washington, D.C.

THE POSSIBLE AND IMPOSSIBLE IN CYBERNETICS

A. Berg and E. Kol'man, ed. 1 Sep. 1964 218 p. Transl. into ENGLISH of the book "Vozmozhnoye i Nevozmozhnoye v Kibernetike" Moscow, Izd. Akad Nauk SSSR, 1963 p 1-222 (JPRS-26201; TT-64-41460) OTS: \$6.00

This is a compilation of articles on cybernetics by Soviet and other scientists and writers. Subjects included those on automatic thinking machines, life, and sense; the ability of a machine to possess psychology; living creatures and the cybernetics device; and cybernetics and creative work. G.D.B.

N64-28062 Joint Publications Research Service, Washington, D.C.

RADIOELECTRICS IN SPACE MEDICINE

I. T. Akulinichev, R. M. Bayevskiy, K. P. Zazykin, and V. R. Freydel' 24 Aug. 1964 53 p. refs. Transl. into ENGLISH from Pamphlet "Massovaya Radiobiblioteka," Moscow, No. 505, 1964 (JPRS-26081; TT-64-41351) OTS: \$3.00

Soviet experiments in space medicine are reviewed briefly. The following are discussed in detail: (1) collection and conversion of medicobiological information; (2) medical radio-electronic equipment used on Soviet earth satellites and space ships; (3) systems of transmission and recording of data; (4) application of radio communication and television in medical control; and (5) application of radioelectronics in space medicine. E.K.R.

N64-28076 Joint Publications Research Service, Washington, D.C.

OXYGEN DEFICIENCY

A. F. Makarchenko 10 Aug. 1964 101 p. refs. Transl. into ENGLISH from the book "Kislorodnaya Nedostatochnost." Kiev, Publ. House of the Academy of Sci., Ukrainian SSR, 1963 p 2-13, 571-610

(JPRS-25796; TT-64-41067) OTS: \$3.00

Results are presented of investigations of leading Soviet laboratories that are resolving the problem of hypoxia and the organism's adaption to it. In particular, questions of the comparative physiology of adaption and acclimatization of the organism to Alpine climates are discussed; contemporary concepts of the significance of cellular chemism in the process of adaption to hypoxia are presented; and material concerning the significance of hypoxemia in the pathologies of childhood and the age factor in the reaction of the organism to hypoxia are cited. New facts about the influence of hypoxia on the distribution of stimuli in the motor zones of the brain, its influence on bioelectric activity, oxygen tension, and energy indices of the cerebral cortex and the subcortical layer are reported. The problem of regional oxygen deficiency and the significance of the latter in the development of myocardial infarction are examined. Also discussed are questions on oxygen starvation

and the mechanisms of compensation to it during cardiac insufficiencies. Questions concerning the diagnostic basis of hypoxic states are also raised. Author

N64-28092 Joint Publications Research Service, Washington, D.C.

ELECTRIC PARAMETERS OF BIOLOGICAL TISSUE IN THE MICROWAVE RANGE

A. R. Livenson 28 Aug. 1964 11 p. refs. Transl. into ENGLISH from Med. Prom. SSSR (Moscow), v. 18, no. 6, 1964 p 14-20

(JPRS-26191; TT-64-41450) OTS: \$1.00

Results of investigations indicate that all biological tissues can be broken down into two groups. The first group includes tissues with a high water content (skin, muscles, internal organs), and the second group is comprised of tissues with a low water content (fat, bone, bone marrow). The first group of tissues is characterized by a relatively high dielectric permittivity and low resistivity. The second group exhibits a dielectric permittivity lower by one order of magnitude and a resistivity higher by one order of magnitude. I.V.L.

N64-28104 Gt. Brit. Dept. of Scientific and Industrial Research Warren Spring Lab.

HUMAN SCIENCES IN INDUSTRY (ANNOTATED BIBLIOGRAPHY). PART I: ERGONOMICS

Jul. 1964 111 p. refs

This annotated bibliography covers the following topics: biotechnology; systems of men and machines; visual inputs and processes; auditory inputs and processes, including speech production and intelligibility; other sensory inputs and processes; body measurements and basic physiological capacities; basic and complex motor performance; design of controls and integration with displays; layout of panels and consoles; design of work space, equipment, and furniture; clothing and personal equipment; special environmental factors affecting performance; individual factors, work conditions, and task characteristics that affect behavioral efficiency; training aids and devices and their use. R.T.K.

N64-28111 Brandeis U., Waltham, Mass.

BACILLUS SUBTILIS DEOXYRIBONUCLEIC ACID TRANSFER IN PBS2 TRANSDUCTION

I. Mahler, M. Cahoon, and J. Marmor Repr. from J. of Bacteriol., vol. 87, no. 6, Jun. 1964 p 1423-1428 refs (Grant NSG-375)

Lysates of the general transducing bacteriophage PBS2 grown on *Bacillus subtilis* SB19 were fractionated by preparative CsCl density-gradient centrifugation. Five distinct and separate bands, which varied in their ability to transduce three nutritional markers, were obtained by this procedure. Deoxyribonucleic acid (DNA) samples prepared from unfractionated lysates and from each of the separate bands were examined by analytical CsCl density-gradient centrifugation. In addition to a major band (density, 1.723 g/cc) identified as PBS2 DNA, a satellite band of lighter density was detectable in the nucleic acids obtained from whole lysates and those bands that possessed transducing activity. The biological activity of the purified nucleic acids, determined by transformation experiments, was found to reside in the light satellite band (1.703 g/cc) characteristic of *B. subtilis* DNA. Author

N64-28114 Flying Personnel Research Committee (Gt. Brit.) INDEX OF UNCLASSIFIED REPORTS AND MEMORANDA

London, Air Min., Jan. 1964 273 p. refs (FPRC/1178)

This document contains a list of 1,206 unclassified reports,
192 unclassified memoranda, and a personal author index.

R.T.K.

N64-28141 General American Transportation Corp., Niles,
Ill. MRD Div.

EXPERIMENTAL EVALUATION OF ENVIRONMENTAL CONTROL SYSTEMS FOR CLOSED SHELTERS

T. R. Charanian and J. D. Zeff Jul. 1964 59 p refs
(Contract OCD-PS-64-6)
(MRD-1242-2530)

This report summarizes the results of an experimental study of oxygen supply and carbon-dioxide control systems that are suitable for use in closed shelters for protection against fallout and/or other weapons effects. Thirty-six simulated occupancy tests and one human-occupancy test were conducted in order to evaluate the performance of passive carbon-dioxide absorption methods. Results are summarized as follows for a 24-hour closed period: (1) Oxygen supply can be provided at a cost of about \$4.70 per person for smaller shelters (100-man) or about \$4.15 per person in larger shelters (1,000-man). (2) A more extensive study is suggested in order to provide specifications, more accurate costs, and installation designs for various size and type shelters. (3) Carbon-dioxide concentration can be controlled by the use of Baralyme (or soda-lime at a slight loss in efficiency) in screened panels at a cost of about \$4.50 per person.

I.V.L.

N64-28228 Wilmot Castle Co., Rochester, N.Y. Research Labs.

STUDIES FOR STERILIZATION OF SPACE PROBE COMPONENTS Progress Report No. 3, 1 Mar.-1 Jun. 1964

Martin G. Koesterer [1964] 19 p
(Contract NASW-879)
(NASA-CR-58284) OTS: \$1.60 ph

Research activities are reported in the following areas: studies on the dry-heat resistance of microorganisms recovered from air samples and added to sterile kaolin; and the demonstration of sterility or determination of the approximate level of contamination of commercial electronic components assayed for levels of contaminating organisms.

R.T.K.

N64-28231 National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

GENETIC RECOMBINATION BETWEEN THE RESISTANCE TRANSFER FACTOR AND THE CHROMOSOME OF *ESCHERICHIA COLI*

Herbert S. Ginoza and Robert B. Painter Repr. from J. of Bacteriol., v. 87, no. 6, Jun. 1964 p 1339-1345 refs
(NASA-RP-296)

Genetic instability for high-level streptomycin and chloramphenicol resistance was observed in several strains of *Escherichia coli* infected with the resistance transfer factor (RTF) episome. The altered site was always found on the chromosome, and the resistance characteristics were similar to, if not identical with, the corresponding determinant found on the episome. The high-level drug-resistance phenotype was ascribed to two separate loci acting cooperatively within the host. The instability phenomenon was attributed to a genetic exchange mechanism in which the chromosome copies the drug-resistance information from the episome, thus giving rise to a diploid homogenote for this segment. In a reciprocal exchange system, the tetracycline-resistance marker on the chromosome was recombined with the RTF episome lacking this information.

Author

N64-28288 Minneapolis-Honeywell Regulator Co., Minn Military Products Group Research Lab.

THE EFFECTS OF HIGH-INTENSITY RADIANT STIMULATION OF VARYING WAVELENGTHS AND DURATIONS ON RETINAL SENSITIVITY Annual Progress Report, No. 1, 1 Jul. 1963-1 Jul. 1964

Norman A. Sidley [1964] 13 p refs
(Contract DA-49-193-MD-2457)
(Rept. 1549-TDR-1; AD-442513)

Apparatus was constructed for training monkeys to respond differentially to light stimuli, and electrophysiological procedures were developed for reliably determining their ERG response to repetitive light flashes. Computer techniques are able to record very low amplitude ERG's, such as may result following flash blindness. Histological-biochemical studies have identified enzymes which are sensitive to light falling on the retina. These studies will allow determination of changes in retinal chemical systems following flash blindness.

Author

N64-28295 Brandeis U., Waltham, Mass.

THE COMPARATIVE ENZYMOLOGY OF LACTIC DEHYDROGENASES. II PROPERTIES OF THE CRYSTALLINE BEEF AND CHICKEN ENZYMES

Amadeo Pesce, Robert H. Mc Kay, Francis Stolzenbach, Robert D. Cahn, and Nathan O. Kaplan Repr. from J. Biol. Chem., v. 239, no. 6, Jun. 1964 p 1753-1761 refs
(Grants NSG-375; NSF G-20029; PHS-G-17680; NIH-CA-03611-06)
(Publ.-281)

Methods for isolating and crystallizing in pure form the chicken and beef skeletal muscle (M) lactic dehydrogenase as well as chicken and beef heart (H) enzymes are given. These pure enzymes consist of only one electrophoretic form. The molecular weights, within experimental error, of all four enzymes appear to be approximately the same. The sedimentation characteristics are also quite similar, although the possibility exists that the beef heart enzyme may be a molecule somewhat different in shape from the other three lactic dehydrogenases. Frictional ratios indicate that the lactic dehydrogenases are all elongated molecules.

Author

N64-28298 Naval Medical Research Lab., New London, Conn.

SPEECH INTELLIGIBILITY DURING PROLONGED EXPOSURE TO HELIUM-OXYGEN Memorandum Report No. 63-8

Russell L. Sergeant 13 May 1963 8 p refs
(AD-602545)

The purpose of this research was to determine whether the well-known Donald Duck effect on the human voice of breathing a mixture containing helium would continue when the breathing of this mixture was continued over a long period of time, or whether there might be some adaptation to this condition, which would produce more nearly normal voice sounds. Speech sounds showed a deterioration in their intelligibility after two days of exposure to HeO₂ mixture; however, by the fourth and sixth day of exposure a return to more normal speech was noted.

Author

N64-28309 Joint Publications Research Service, Washington, D.C.

PHOTOSYNTHESIS AND RADIATIVE TRANSITIONS

5 Aug. 1964 24 p refs Transl. into ENGLISH of 2 articles from Biofizika (Moscow), v. 9, no. 3, 1964 p 293-305
(JPRS-25733; TT-64-41004) OTS: \$1.00

CONTENTS:

1. THE THERMODYNAMICS OF PHOTOSYNTHESIS
L.H. Bell p 1-10 refs (See N64-28310 20-16)

2. DETERMINATION OF THE PROBABILITY OF SINGLET-SINGLET AND SINGLET-TRIPLET TRANSITIONS IN MOLECULES POSSESSING A CONJUGATE SYSTEM OF π -ELECTRONS Yu. V. Morozov and A. I. Kuklin p 11-21 refs (See N64-28311 20-16)

N64-28310 Joint Publications Research Service, Washington, D.C.

THE THERMODYNAMICS OF PHOTOSYNTHESIS

L. H. Bell *In its Photosyn. and Radiative Transitions* 5 Aug. 1964 p 1-10 refs (See N64-28309 20-16) OTS: \$1.00

The thermodynamics of photosynthesis was investigated. Results indicate the following: (1) Thermodynamics imposes a restriction on the maximum possible energy yield from photosynthesis (η_m). (2) The highest theoretical values of η_m are obtained when plants are irradiated with light from bright sources. (3) The highest values of η_m are obtained when working with directed, monochromatic pencils of light, for a given irradiation of a plant. (4) The $\eta_m = 0.94$ in the case of plants irradiated with sunlight, if the rays are direct. In the case of "light-loving" plants, for which the compensation point is 500 erg/cm²/sec, $\eta_m = 0.68$. (5) Thermodynamics does not permit the functioning of a four-quantum mechanism, at the lowest light intensities encountered in practice. I.v.L.

N64-28311 Joint Publications Research Service, Washington, D.C.

DETERMINATION OF THE PROBABILITY OF SINGLET-SINGLET AND SINGLET-TRIPLET TRANSITIONS IN MOLECULES POSSESSING A CONJUGATE SYSTEM OF π -ELECTRONS

Yu. V. Morozov and A. I. Kuklin *In its Photosyn. and Radiative Transitions* 5 Aug. 1964 p 11-21 refs (See N64-28309 20-16) OTS: \$1.00

This report deals with the values of the quantum yield and the average duration of fluorescence, at room temperature, for acridine orange in the following media: glycerin and glucose, phosphorus boroglyceride, and sugar crystals. I.v.L.

N64-28317 Documentation Incorporated, Bethesda, Md. Man-Machine Information Center

BIBLIOGRAPHY RELATED TO HUMAN FACTORS SYSTEM PROGRAM, JULY 1962-FEBRUARY 1964

Richard J. Potocko Washington, NASA, 1964 242 p refs (NASA-SP-7014) OTS: \$3.50

N64-28320 National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

RADIATION DOSIMETRY ABOARD THE SPACECRAFT OF THE EIGHTH MERCURY-ATLAS MISSION (MA-8)

Carlos S. Warren and William L. Gill Washington, NASA, Aug. 1964 22 p refs (NASA-TN-D-1862) OTS: \$0.50

The creation of an artificially trapped electron belt by a high-altitude nuclear explosion on July 9, 1962, made it necessary to place radiation dosimeters aboard the spacecraft used in the eighth Mercury-Atlas mission (MA-8) on October 3, 1962, since the last three orbits passed through a magnetic field anomaly where the belt exists at Mercury flight altitudes. Dosimeters on board the spacecraft of the MA-8 mission were a self-indicating ionization chamber, lithium fluoride thermoluminescent detectors, and nuclear emulsions. The measurements indicated that the astronaut received less than 30-milirads body-surface dose. Author

N64-28425 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM BULLETIN OF EXPERIMENTAL BIOLOGY AND MEDICINE, NO. 3, 1964

14 Jul. 1964 50 p refs Transl. into ENGLISH of 6 Articles from *Byuleten' Eksperimental' no Biologii i Meditsiny* (Moscow), v. 57, no. 3, 1964

(JPRS-25464; TT-64-31736) OTS: \$1.25

Articles on the following topics are reported: (1) the effect of dark and light adaptation of the eye on the function of cutaneous thermoreceptors in man; (2) the effect of antibiotic therapy on serotonin and histamine levels in the blood and organs of irradiated rabbits; (3) the passage of Sr⁹⁰ and Ca⁴⁵ through the placenta of rats; (4) the effect of anti-irradiated-tumor-tissue serum on the mitotic activity of the Ehrlich carcinoma in mice; (5) cytophotometric indications of the nonuniformity of premitotic DNA reduplication processes in the cells of mammals; and (6) the development of a method for separate graphic recording of ohmic and capacitive components of the elastic resistance of a section of human pulmonary tissue. M.P.G.

N64-28430 Joint Publications Research Service, Washington, D.C.

STUDIES IN HYGIENE AND SANITATION IN THE USSR

8 Sep. 1964 42 p refs Transl. into ENGLISH from *Gigiyena i Sanit.* (Moscow), v. 29, No. 4, 1964

(JPRS-26305; TT-64-41564) OTS: \$2.00

CONTENTS:

1. LARGE SCALE CHEMISTRY AND PROBLEMS OF HYGIENE G. Kh. Shakhbazyan p 1-8
2. THE INFLUENCE OF INTENSE NOISE ON CERTAIN FUNCTIONS OF THE ORGANISM A. B. Strakhov p 9-20 refs
3. CERTAIN ASPECTS OF THE BIOLOGICAL ACTION OF ULTRASONICS IN CONNECTION WITH ITS APPLICATION IN INDUSTRY S. I. Gorshkov, O. N. Gorbunov, R. M. Nikol'skaya p 21-29 refs
4. A GERONTOLOGICAL MAP OF THE RUMANIAN PEOPLE'S REPUBLIC A. Chuka, R. Kresin et al p 30-39

N64-28431 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON COMMUNIST CHINA'S SCIENCE AND TECHNOLOGY, NO. 104

25 Aug. 1964 53 p refs Transl. into ENGLISH from CHINESE Periodicals

(JPRS-26103; TT-64-41363) OTS: \$3.00

CONTENTS:

1. A REVIEW OF RESEARCH AND DEVELOPMENT OF ACOUSTICS OF THE SEA You Fang-hu and Chiu Yung-te p 1-25 refs
2. STEADY INCREASE IN NUMBER OF COLLEGE GRADUATES FROM MINORITY PEOPLES IN SINKIANG p 26-27
3. YOUNG TEACHERS DISPATCHED TO LABORATORIES. PLANS PUT IN MOTION TO BUILD UP LAB WORK p 28-36
4. NORMAL FRANK VECTORCARDIOGRAM—COMPARED WITH THE CUBIC VECTOR SYSTEM Kung Lan-sheng, Tao Ch'ing, Yang Chi-no, P'an Hua-shan, and Li Chao-chi p 37-38
5. ANALYSIS OF FRANK VECTORCARDIOGRAPHY IN ONE HUNDRED NORMAL INDIVIDUALS Huang Ming-hsin, Yu Kuo-ju, Hsia Yung-k'ang, and Hsu Hsueh-fang p 39
6. DURATION OF NORMAL HEART SOUNDS Kao Yun-chiu, Chin Jui-ho, Yang Ta-p'eng, Hsu Tsu-po, and Shih Shu-ku p 40

7. A CYTOCHEMICAL STUDY OF LEUKEMIC LEUCOCYTES—A DEMONSTRATION OF PEROXIDASE AND SUCCINIC DEHYDROGENASE Wang Sheng-yuan, Wu Chiang-sheng, and Fu Shih-hsien p 41-43
8. MORPHOLOGICAL DISTINCTION BETWEEN POLYMORPHONUCLEAR NEUTROPHIL LEUCOCYTES OF MALE AND FEMALE Lou Chi-chi, Yang Tsan-yuan, Chen Jen-chun, and Chung Ch'uan-ch'ing p 44-45
9. IDIOPATHIC HYPOPARATHYROIDISM—A REPORT OF 11 CASES Yin Wei, Chang Chun, Wang Tun-mei, Kao Yu-ch'i, and Chu Hsien-i p 46
10. ATYPICAL SYMPTOMS OF BILIARY DISORDERS—AN ANALYSIS OF 70 CASES Wang Pao-szu, Chiang Po-ching, Kao Shou-cheng, Yu Chung-lin, and Ch'a Liang-i p 47-48
11. DIAGNOSIS OF LIVER PARASITES BY ULTRASOUND Chang Yen-po, Ni Shih-chen, Ch'en Wen-k'uei, Chi Chen-i, and Chang Chih-chan p 49-50

N64-28432 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM BOL'SHAYA MEDITSINSKAYA ENTSIKLOPEDIYA [MOSCOW] (GREAT MEDICAL ENCYCLOPEDIA), vol. 33, 1963

25 Aug. 1964 69 p refs Transl. into ENGLISH of 3 Articles from a RUSSIAN Periodical (JPRS-26116; TT-64-41376) OTS: \$3.00

CONTENTS:

1. UKRAINIAN SOVIET SOCIALIST REPUBLIC (The Ukraine) p 1-27 refs
2. ACCELERATION p 28-38 refs
3. CHEMOTHERAPY p 39-66 refs

N64-28439 Joint Publications Research Service, Washington, D.C.

ORGANIZATION OF MEDICAL COUNTERMEASURES AGAINST RADIATION ACCIDENTS DUE TO EQUIPMENT DAMAGE OR BREAKDOWN

K. Neumeister 20 Aug. 1964 14 p refs Transl. into ENGLISH from Deut. Gesundheitsw. (E. Berlin), No. 28, 9 Jul. 1964 p 1293-1297 (JPRS-26021; TT-64-41291) OTS: \$1.00

The following medical needs and countermeasures against radiation accidents due to equipment damage or breakdown are discussed: (1) immediate first-aid measures in radiation accidents occurring in isotope laboratories; (2) radiation-accident-treatment measures in the clinic; (3) items needed by isotope laboratories for the initial care of radiation victims; (4) medication needed by the radiation-protection physician in caring for radiation-accident victims; (5) items required by the clinic for the care of radiation-accident victims; (6) government tasks in protection against nuclear weapons; (7) medical preventive measures for disaster control; and (8) the mission of medical clearing stations in cases of disaster. In addition, a classification of radiation injury is described.

I.V.L.

N64-28446 Joint Publications Research Service, Washington, D.C.

STUDIES ON CONDITIONED REFLEXES

21 Aug. 1964 97 p refs Transl. into ENGLISH of 8 Articles from Zh. Vysshay Nervnoy Deyatel'nosti (Moscow), v. 14, no. 3, 1964 (JPRS-26060; TT-64-41330) OTS: \$3.00

CONTENTS:

1. STUDY OF THE DYNAMICS OF THE FREQUENCY-SPECIFIC REACTION OF BRAIN AND RETINA BIOPOTENTIALS TO PROLONGED PHOTIC STIMULATION BY THE CORRELATION ANALYSIS METHOD N. N. Danilova p 1-15 refs
2. INFLUENCE OF THE SCHOOL DAY ON PERCEPTION OF TIME A. S. Dmitriev, A. P. Ozhigova, and T. V. Tushmove p 16-28 refs
3. EXTINCTION OF THE ORIENTING REACTION AFTER CUTTING AND REMOVING THE AUDITORY CORTEX M. M. Karimova, D. M. Bowden, and Ye N. Sokolov p 29-39 refs
4. PHYSIOLOGICAL SIGNIFICANCE OF THE RHYTHM AND INTENSITY COMPONENTS OF THE ACOUSTIC FOOD CONDITIONED REFLEX V. I. Syrens'kiy p 40-45 refs
5. RELATIONSHIP BETWEEN THE PRIMARY RESPONSE OF THE AUDITORY CORTEX IN WAKEFUL CATS AND THE TIME PARAMETERS OF THE SIGNAL G. V. Gershuni, I. A. Shevelev, and A. M. Likhnitskiy p 46-57 refs
6. INFLUENCE OF REMOVAL OF THE RABBIT CORTICAL VISUAL PROJECTION ZONE ON RESPONSES OF THE LATERAL GENICULATE BODY P. P. Gustson p 58-66 refs
7. FUNCTIONAL MORPHOLOGY OF INTERNEURON SYNAPSES N. N. Bogolepov p 67-82 refs
8. AUTOMATIC ANALYSIS OF THE DURATION OF THE ASCENDING AND DESCENDING PHASES OF ELECTRO-ENCEPHALOGRAPH OSCILLATIONS A. A. Genkin, V. K. Zakharov, and V. I. Tarabukin p 83-94 refs

N64-28448 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

CERTAIN PROBLEMS IN THE INFLUENCE OF IONIZING RADIATION ON THE NERVOUS SYSTEM

M. N. Livanov 4 May 1964 334 p refs Transl. into ENGLISH of the book "Nekotoryye Problemy Deystviya Ioniziruyushchey Radiatsii na Nervnyu Sistemy" Moscow, Gos. Izd. Med. Lit., 1962 p 5-196 (FTD-TT-63-582/1+2; AD-601827)

An analysis of a series of problems encountered in studying the effects of radiation on the nervous system is presented. The problems are divided into the following general categories: (1) sensitivity of the nervous system to exposure to ionizing radiation; (2) basic mechanisms of ionizing-radiation effect on the nervous system; (3) the intercentral relations in experimental radiation sickness; (4) hypothalamus as a factor in experimental acute radiation sickness; and (5) interdependence of some body functions and successive states affecting the cerebral cortex, induced by ionizing radiation

P.V.E.

N64-28562 Aerospace Medical Div. Aerospace Medical Research Labs. (65570th), Wright-Patterson AFB, Ohio Naval School of Aviation Medicine, Pensacola

MOTION SICKNESS SYMPTOMATOLOGY OF LABYRINTHINE DEFECTIVE AND NORMAL SUBJECTS DURING ZERO GRAVITY MANEUVERS

Robert S. Kellogg, Robert S. Kennedy, and Ashton Graybiel Jun. 1964 15 p refs Prepared Jointly with Naval School of Aviation Med.

(NASA Order R-47)

(AMRL-TDR-64-47; AD-603339)

Labyrinthine defective (L-D) and normal subjects were flown through zero-gravity maneuvers and their motion sickness symptomatology observed. The L-D subjects showed no

signs of motion sickness, whereas 64% of the normal subjects developed symptoms. The absence of functional labyrinthine mechanisms appreciably decreased, and probably completely eliminated, susceptibility to motion sickness during zero-gravity maneuvers.

Author

N64-28565 Air Force Systems Command, Wright-Patterson AFB, Ohio Aerospace Medical Research Labs.

X-20A FULL-PRESSURE SUIT QUANTITATIVE PERFORMANCE

J. D. Bowen May 1964 46 p
(AMRL-TDR-64-36; AD-603701)

A series of experimental procedures was accomplished to demonstrate and measure the protection X-20A Dyna-Soar pilots obtain by wearing their custom fitted pressure garments while exposed to simulated mission conditions. Mission conditions were simulated to the extent possible with available altitude and temperature test facilities. Physical characteristics of the garments were determined, such as weight, pressure drop with flow, dimensional stability, visual fields, and acoustical attenuation.

Author

N64-28581 Innsbruck U. (Austria) Inst. of Experimental Psychology

COLOR DISCRIMINATION WITHOUT CHROMATIC VISION

Second Annual Technical Report, Jul. 1, 1963-Jun. 30, 1964

Anton Hajos 1 Jul. 1964 94 p refs

(Contract DA-91-591-EUC-2917)

(Rept. 2, AD-603031)

The results of measurements obtained for experiments with prism glasses of three different types (cross-eye glasses, plugged glasses, and monocle glasses) are discussed. The measurements were taken for three distortion effects—displacement caused by deviation, curvature of straight lines caused by the differences of deviation depending on the angle-of-incidence of the beam passing through the prism, and the chromatic fringes formed by the dispersion of the prisms. The values show that aftereffects of displacement and curvature are totally transferred to the other eye. Two examples of values for displacement with a symmetrically opposite stimulus input are demonstrated with cross-eye glasses. The results of the measurements were different in each subject. Changes of values for rainbow fringes in all of the experiments conducted with cross eye glasses clearly demonstrated that each eye adapts to rainbow fringes. The amount of adaptation lies in the same range as for other types of glasses. It is shown that the adaptation is of different magnitude for different subjects.

R.T.K.

N64-28604 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio Behavioral Sciences Lab.

THE EFFECT OF DIRECTION AND SPEED OF IMAGE MOTION UPON TARGET DETECTION WITH SIDE-LOOKING RADAR

Fen Rhodes and H. C. Self Jun. 1964 14 p refs
(AMRL-TDR-64-45; AD-603598)

Sixteen navigator-bombardiers were required to find airfields, bridges, railroad yards, and tank farms on side-looking radar imagery when the imagery was moving either vertically, top to bottom; or horizontally, left to right. The imagery was presented at simulated aircraft speeds of either Mach 1 or Mach 2.8 on a 14 by 14 inch rear projection screen at a scale of 1.93.900. The average distance that targets traveled on the screen before being detected was significantly less for the vertical condition. However, neither the number of targets detected nor the proportion of false targets reported was significantly influenced by the direction of image motion. More

targets were detected, and the average distance the target traveled before being detected was less at the slower speed. Image speed had no significant effect on the number of false targets reported.

Author

N64-28631 Joint Publications Research Service, Washington, D.C.

EFFECT OF T-1 BRAND FUEL UPON THE SKIN

L. V. Shevlyakov 6 Nov. 1962 4 p Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 5, 1955 p 83-84
(JPRS-16055) OTS: \$1.10

A type of aircraft fuel was responsible for causing dermatitis, especially in mechanics. Treatment for this is described.

G.D.B.

N64-28636 Educational Research Corp., Cambridge, Mass.
JAMES J. GIBSON ON VISUAL PERCEPTION: ANALYSIS OF SELECTED PAPERS

Milton W. Horowitz Feb. 1964 43 p refs

(Contract N 61339-294)

(NAVTRADEVCE-294-5; AD-602283) OTS: \$1.25

This paper is an analysis of Gibson's point of view in psychology. It is primarily based on 50 scientific papers published in scholarly journals by him and his colleagues, but to some extent it also mirrors the research of other writers in the field of perception. Although these papers cover 20 years of Gibson's life, and hence reveal his evolution as a scientist to some extent, the great majority of them have been published in the last 10 years, when his work had become programmatic, and reveal a systematic progress in the field of visual perception. The report indicates the general principles of visual perception that have been explicated by Gibson with a view toward the eventual utilization of these principles in the construction of visual displays for training purposes.

Author

N64-28649 Texas U., Dallas Southwestern Medical School
A RELATIONSHIP BETWEEN GROWTH AND GRAVITY IN BACTERIA

P. O'B. Montgomery, F. Van Orden, and E. Rosenblum Repr. from Aerospace Med., v. 34, no. 4, Apr. 1963 p 352-354 refs
(Grant NSG-210-62)

When *E. coli* cultures are subjected to gravitational fields of 110.000 X g for 24 hours the following disturbances in growth were observed—increased log phase, prolonged generation time, decreased maximal concentration, and prolonged time required to reach maximal concentration. These alterations in growth patterns did not occur in bacterial cultures of *E. coli* subjected to a gravitational field of 1.000 X g for 24 hours

Author

N64-28659 Institut Pasteur, Paris (France)

INTERACTIONS OF THE RADIATIONS AND DESOXYRIBONUCLEIC ACIDS [INTERACTIONS DES RADIATIONS ET DES ACIDES DESOXIRIBONUCLEIQUES]

R. Latarjet Brussels, EURATOM, May 1964 12 p in FRENCH; ENGLISH summary

(Contract EURATOM-005-61-1 Biof)

(EUR-1646.f) Available from Belgian Am. Bank and Trust Co., N.Y., Account No. 22.186: 40 Belg. Fr.

The research results described in this document concern seven closely interrelated fields: (1) the radiochemistry of pyrimidine bases; (2) the action of radiation on transforming DNA of bacteria; (3) the radiobiology of lysogenic bacteria; (4) the effect of radioactive disintegrations in yeast; (5) the lethal effect of radioactive atoms incorporated in DNA; (6) the action of the radiations on genetic recombination; and (7) the radio peroxidation mechanism (application to DNA)

Author

N64-28696 Naval Air Development Center, Johnsville, Pa.
Aeronautical Computer Lab.
APPLICATION OF HARMONIC ANALYSIS IN A STUDY OF TRACKING PERFORMANCE IN THE TV-2 AIRCRAFT AND IN CENTRIFUGE AND STATIONARY SIMULATIONS OF THAT AIRCRAFT
H. G. Tremblay, John L. Brown, and A. Futterweit 30 Apr. 1964 28 p refs
(NADC-AC-6406; AD-602178)

Piloting performance in a continuous tracking task was studied in an aircraft, in human centrifuge simulations controlled by a computer simulation of the aircraft, and in a stationary simulation. Continuous records of elevator and aileron control surface deflections were subjected to a power spectral density analysis. Results indicate that there is a reduction in the contributions of high-frequency components of power, successively, from the static simulation to the centrifuge simulations, to the aircraft itself. The power spectral density function for performance in a centrifuge simulation is more like that for the aircraft than is the power spectral density function in a static simulation.

Author

N64-28698 Flying Personnel Research Committee (Gt. Brit.)
PHYSIOLOGICAL REQUIREMENTS FOR PROTECTION AGAINST ATMOSPHERIC PRESSURE CHANGES
D. I. Fryer (RAF Inst. Aviation Med.) London, Air. Min., Nov. 1963 13 p refs Presented at the RAE Symp. on Pressure Suits, Apr. 1962
(FPRC/MEMO-201)

In the absence of any satisfactory method of obtaining protection by the provision of an adequately high ambient pressure, it may be necessary to resort to other means of influencing the susceptibility of exposed personnel. So far as is known, there is only one practical physiological method and that is to reduce the total amount of nitrogen stored in the body and, in particular, to reduce its concentration in certain particularly vital parts. In operational terms, this means maintaining preoxygenation with some pure oxygen at ground level, either in the crew room or in the aircraft for some considerable period before takeoff, with no breaches of oxygen discipline, or the use of air mix or pure oxygen at fairly high cabin altitudes. Fair estimates of hazards due to atmospheric pressure changes in terms of forced descents can be made in certain well-defined groups of personnel for periods up to 2 hours at high altitudes. Beyond 2 hours, extrapolation is required, and the accuracy of estimates is reduced.

I.v.L.

N64-28764 Wilmot Castle Co., Rochester, N.Y. Research Labs.
STUDIES FOR STERILIZATION OF SPACE PROBE COMPONENTS Final Report, Aug. 1, 1962-Aug. 31, 1963
Martin G. Koesterer [1963] 44 p refs
(Contract NASw-550)
(NASA-CR-58285) OTS: \$4.60 ph

Dry-heat sterilization of space probes, particularly at 125° and 135° C. was studied. Biological, chemical, and physical factors influencing the sterilization effectiveness of the dry-heat process were investigated.

D.E.W.

N64-28767 Texas U., Dallas Southwestern Medical School
ULTRASTRUCTURAL ALTERATIONS INDUCED IN E. COLI B BY GRAVITY
P. O'B. Montgomery, Betty Neumeyer, and Eugene Rosenblum
Repr. from Aerospace Med., v. 35, no. 4, Apr. 1964 p 360-361 refs
(Grant NsG-210-63)

Bacterial cells subjected to gravitational fields of 110,000 X g for 24 hours were examined by electron microscopy. Cells so treated appear larger than control cells. The enlargement appears to be due to an overall enlargement of the cell with hypertrophy of some of the intracellular components. The possibilities that these observations are due to a dissociation between cell growth and cell division, and that they may represent genetic changes are considered.

Author

N64-28788 Oak Ridge National Lab., Tenn.
EFFECTS OF RADIATION ON THE MAMMALIAN EYE. A Literature Survey
H. D. Lazarus Jul. 1964 30 p
(TID-3912) Available from Natl. Bur. of Standards, Springfield, Va.

A subject index is presented for a companion document, "Effects of Radiation on the Mammalian Eye. A Literature Survey." References in this subject index are referred to page numbers in the literature survey.

M.P.G.

N64-28812 Pennsylvania U., Philadelphia
NON-THERMAL EFFECTS OF ALTERNATING ELECTRICAL FIELDS ON BIOLOGICAL STRUCTURES Final Report, 1 Jan. 1963-29 Feb. 1964
Herman P. Schwan 30 Apr. 1964 13 p refs
(Contract Nonr-551(05))
(AD-600263)

Four nonthermal effects of alternating electrical fields have been assessed for their possible biological significance. The effects, all the result of mechanical forces on particles dispersed in a fluid, are these: (1) pearl-chain formations that do not occur in human beings exposed to a microwave beam with an incident rms power density of less than 10 mw/cm²; (2) orientation of nonspherical particles that is most unlikely in human beings, since it is improbable that any histological structure is superficial, sufficiently large, and free to be oriented; (3) forces in inhomogeneous fields due to microwave irradiation appear to be of no biological significance, since skin has no freely movable, micron-size particles; and (4) the effect of alternating electrophoresis at microwave frequencies has been demonstrated to be infinitesimal. None of the four nonthermal effects, therefore, has biological significance for human beings exposed to a "thermally safe" microwave field.

A.W.

N64-28833 Naval School of Aviation Medicine, Pensacola, Fla. Naval Aviation Medical Center
SPINAL MOTOR RESPONSES TO ACOUSTIC STIMULATION Report No. 2
Bo E. Gernandt and Harlow W. Ades 22 Apr. 1964 18 p refs
(NASA Order R-93)
(NASA-CR-58548) OTS: \$1.60 ph

Certain aspects of the mechanisms mediating auditory-induced spinal motor activity were examined by recording within the bulb and from motoneurons at both cervicothoracic and lumbosacral levels. Single auditory click stimulation elicits, in lightly strychninized cats, motor responses appearing along both sides of the spinal cord. In competition for access to the final common path, the evoked descending acoustic volley of impulses is readily blocked by prior dorsal root stimulation. Since the ventral root responses recorded contralaterally to the side of auditory stimulation have the same appearance, respond identically to higher frequency stimulation, and interact with dorsal root responses in an identical manner, as do the ipsilateral ventral root responses, it is assumed that the acousticospinal mechanisms on the two sides

of the spinal cord are mirror images of each other, elicited from a common brain stem neuronal pool. Decerebration and cerebellectomy do not interfere with the transmission of this acousticospinal reflex activity. Auditory projections to the brain stem reticular formation are evidently sufficient to maintain the pattern of the descending reflexes. Bilateral motoneuron discharges following unilateral acoustic stimulation are insured by an abundance of functional crossings in the bulb and along the extent of the spinal cord. I.V.L.

N64-28838 Northrop Corp., Hawthorne, Calif. Northrop Space Labs

INVESTIGATION OF PEROGNATHUS AS AN EXPERIMENTAL ORGANISM FOR RESEARCH IN SPACE BIOLOGY

Second Quarterly Progress Report, 1 Apr.-31 Jul. 1964

J. J. Gambino and R. G. Lindberg [1964] 25 p refs

(Contract NASW-812)

(NASA-CR-58526; NSL-64-29-3) OTS: \$2.60 ph

High LD_{50/30} values exhibited by two species of pocket mice, *Perognathus longimembris* and *P. formosus*, suggest a natural resistance to whole-body irradiation in this genus unparalleled among the mammals. In order to test the hypothesis that low oxygen tension may be acting to produce the observed low radiation sensitivity, an experiment was designed to determine whether hypoxia of critical radiosensitive tissues is present in pocket mice during irradiation. It was found that pocket mice, like most hibernators, adjust to a reduction in ambient oxygen by reducing their body temperature; however, arousal occurs immediately after normal atmospheric oxygen is restored. More animals were found to tolerate a gradual oxygen reduction to levels that were lethal for sudden exposure, suggesting that pocket mice may not be tolerant to hypoxia at the cellular level but rather that their hypoxia tolerance may be based solely on their efficiency in reducing metabolic need for oxygen. The fact that *Perognathus* can survive 5% oxygen at 10° C ambient temperature suggests a means for reducing even further payload requirements in space biology experiments. M.P.G.

N64-28859 Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE

V. I. Yazdovskiy 2 Sep. 1964 74 p Transl. into ENGLISH of the book "Biologiya i Kosmos. Problemy Kosmicheskoy Biologii i Meditsiny" Moscow. Znaniye Publishing House, 1964 p 3-80

(JPRS-26231; TT-64-41490) OTS: \$3.00

Reasons for the exploration of space are discussed, along with the problems that will be encountered. Problems discussed include zero gravity, large acceleration forces, absence of suitable atmospheres, and time lapses in traveling to distant reaches of space. P.V.E.

N64-28876 Naval School of Aviation, Pensacola, Fla. Naval Aviation Medical Center

THE EFFECTS OF CORIOLIS ACCELERATION DURING ZERO GRAVITY FLIGHT ON CERTAIN HEMATOLOGICAL AND URINARY PARAMETERS IN NORMAL AND LABYRINTHINE DEFECTIVE SUBJECTS Report No. 2

James K. Colehour 19 May 1964 13 p refs

(NASA Order R-93)

(NASA-CR-58675) OTS: \$1.60 ph

When normal subjects were exposed to repetitive, zero gravity, parabolic flight, significant increases in neutrophils, eosinophils, and urinary 17-hydroxycorticosteroids occurred

as indicators of stress. In similar experiments when Coriolis acceleration was additionally imposed during zero gravity, much greater stress was indicated by the same measurements. Subjects with meningitis-derived labyrinthine defects did not respond in a similar manner. It is concluded that functionally intact vestibular organs must be present to activate the hypothalamic-pituitary-adrenal axis in abnormal g environment.

Author

N64-28894 California U., Berkeley Space Sciences Lab.
CHEMISTRY OF LIVING SYSTEMS Annual Progress Report, Period Ending Jul. 1, 1964

Thomas H. Jukes 1 Jul. 1964 26 p

(Grant NsG-479)

(NASA-CR-58547) OTS: \$2.60 ph

Progress and results are reported for studies on enzyme content and function of polysomes, sequence of bases in RNA, RNA polymerase, composition and function of the chromosome of *Bacillus subtilis*, and the mechanism of antibody production.

D.E.W.

N64-28902 Naval Training Device Center, Port Washington, N.Y. Human Factors Lab.

EMPTY VISUAL FIELD STUDIES: SOME EFFECTS OF CORRECTIVE LENSES, FILTERS, AND STRUCTURE

Milton S. Katz, Paul A. Cirincione, and William Metlay 22 Jun. 1964 28 p refs

(NAVTRADEVVCEN IH-14, AD-445863)

A total of six false target detections was made by all subjects during data collection. These false detections were not characteristic of any single subject or experimental condition. Because of the extremely small percentage that these represent (0.02%), no further analysis was made. The effect of structure in the visual field was assessed by a comparison of the number of targets detected in each field. The differences in target detection scores between the structured visual field and the homogeneous visual field were found to be significant ($p < .01$). Target detection scores for all treatments combined and plotted as a function of target size are shown.

Author

N64-28916 Montana State Coll., Bozeman Electronics Research Lab.

TOWARDS A THEORY OF THE RETICULAR FORMATION
Scientific Report No. 1

W. L. Kilmer and W. S. Mc Culloch Apr. 1964 43 p refs

(Contract AF 19(628)-3807)

(ERL-8-0009-622, AFCRL-64-463, AD-604883)

Throughout the life of the vertebrates, the core of the central nervous system, sometimes called the reticular formation, retained the power to commit the whole animal to one mode of behavior rather than to another. Its anatomy, or wiring diagram, is fairly well known, but to date no theory of its circuit action has been proposed that could possibly account for its known performance. Its basic structure is that of a string of similar modules, wide but shallow in computation everywhere, and connected not merely from module to adjacent module, but by long jumpers between distant modules. Analysis of its circuit actions heretofore proposed in terms of finite automata or coupled nonlinear oscillators has failed. Proposed are probabilistic automata that handle regular events as proper modules, and give some novel stability theorems regarding them. The behavior of a connected chain of such modules is still under investigation.

Author

N64-28935 Stanford Research Inst., Menlo Park, Calif.

STUDIES ON THE HILL REACTION ACTIVITY OF SOLUBLE CHLOROPLAST EXTRACTS Quarterly Progress Report, 1 Mar.-1 Jun. 1964

Bruce Graham 21 Aug. 1964 10 p refs

(Contract NASR-49(11))

(Rept.-5; NASA-CR-58340) OTS: \$1.10 ph

This study is concerned with the mechanisms and essential reactants of that part of the photosynthetic process in which oxygen is produced by photolysis of water. This is essentially the light absorbing reaction that can be studied in vitro separately from the carbon dioxide fixing reactions. The photolysis of water and evolution of oxygen that occur when chloroplasts or fragments of them are illuminated in the presence of a suitable electron acceptor are generally referred to as the Hill¹⁷⁻¹⁸ reaction. Attempts to reduce the Hill reaction system to a nonparticulate state have generally resulted in loss of activity.

Author

N64-28939 United Aircraft Corp., Windsor Locks, Conn. Hamilton Standard Div.

[APPLICATION OF STATISTICAL DECISION TECHNIQUES TO THE CHOICE OF EXTRATERRESTRIAL LIFE DETECTORS] First Quarterly Progress Report

Dian R. Hitchcock and Gordon B. Thomas [1964] 11 p

(Contract NASW-871)

(NASA-CR-58531) OTS: \$1.60 ph

The activities were directed primarily at surveying some of the decision problems associated with the extraterrestrial life-detection program, orienting project personnel, identifying concrete subproblems to be employed as vehicles for the development of operational analysis and statistical decision techniques, and initial efforts directed toward exploring and solving these problems. A brief description of the first model to be simulated is included.

Author

N64-28947 Armed Forces Inst. of Pathology, Washington, D.C.

INFLUENCE OF HYDRAZINE AND HYDRAZINE DERIVATIVES ON INTERMEDIARY METABOLISM

Abel M. Dominguez, Joseph S. Amenta, and Thaddeus J. Domanski [1964] 2 p Preprint of a Paper Presented at the Aerospace Med. Assn. 35th Ann. Sci. Meeting, Bal Harbour, Fla., 11-14 May 1964

(Contract NASA A-31086)

The possibility of application in vivo of a rapid screening technique for metabolic studies of chemical toxicity of hydrazine and its derivatives 1,1 dimethylhydrazine (UDMH), 1,2 dimethylhydrazine (SDMH), monomethylhydrazine (MMH), and iproniazid was studied in rats. The experiments were based on the measured rate of expiration of C¹⁴O₂ derived from injected, labeled amino acids and acetate. The findings were evaluated by analysis of variance. A dose of nonlabeled substrate (1 or 3×10⁻³ moles) injected intravenously showed a 70% to 80% reduction in the ability of hydrazine-treated animals to oxidize glycine-1-C¹⁴. No difference was noted with acetate-1-C¹⁴. Similar results were received with MMH, UDMH, and, to a lesser degree, with SDMH and iproniazid. The conversion of glucose C¹⁴ (UL) was depressed in hydrazine- and UDMH-treated animals.

Author

N64-28948 North American Aviation, Inc., Columbus, Ohio **OPERATOR PERFORMANCE IN SIMULATED LOW-ALTITUDE HIGH-SPEED FLIGHT.**

Stanley M. Soliday [1964] 4 p refs Preprint of a Paper Presented at the Aerospace Med. Assn. 35th Ann. Sci. Meeting, Bal Harbour, Fla., 11-14 May 1964

(Contract NASW-451)

During simulated flight, performance and physiological response of 8 experienced jet pilots were measured and related to 2 aircraft speeds, 3 gust levels, and 2 types of terrain. Deviations from 500 ft (altitude errors) increased with increasing g, but pilots were able to maintain headings equally well under

all experimental conditions. Breathing was faster at a gust level of 10 fps than at 2 fps, but no significant differences were found between 10 and 20 fps. No significant difference in heart rate was found, nor was fatigue important in error determination of flight up to 90 minutes. Pitch and altitude errors were reduced when the side-stick controller was substituted for the center-stick controller.

Author

N64-28949 General Dynamics Corp., Groton, Conn. Electric Boat Div.

MULTIFILTER SYSTEM FOR WATER RECLAMATION

H. Wallman, J. Steele, and J. Lubitz [1964] 5 p refs Preprint of a paper presented at the Aerospace Med. Assn. 35th Ann. Sci. Meeting, Bal Harbour, Fla., 11-14 May 1964

(Contract NASI-2208)

The multifilter subsystems were tested and found to give recovered water of the required quality. The dehumidification water subsystem produced potable water from air-conditioning condensate obtained from a space simulator. The wash water subsystem produced water suitable for reuse as wash water. The multifilter scheme is recommended on the basis of its high reliability, simplicity, zero power requirement, and inherent zero-g capability. Based on the amount of water remaining in the subsystems, the following water recovery efficiencies were calculated: dehumidification water system — 99.5%; wash water subsystem — 99.0%.

Author

N64-28950 School of Aerospace Medicine, Brooks AFB, Tex. **HEART RATE PATTERNS OBSERVED IN MEDICAL MONITORING**

David G. Simons and Robert L. Johnson [1964] 5 p refs Preprint of a Paper Presented at the Aerospace Med. Assn. 35th Ann. Sci. Meeting, Bal Harbour, Fla., 11-14 May 1964

(Sponsored by NASA)

A classification and examples of heart rate patterns observed in response to a variety of stresses encountered in space flight are presented. The pattern classification provides a basis for automated quantification of heart rate responses. Conditions under which these patterns have been observed include sleep, quiet resting while awake, clinical dynamic stress testing, (breath-holding and hypoxia), and aircraft flight exposure to increased g-forces. The electrocardiograph and the cardiotachometer were used for observations.

Author

N64-29018 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

ABOUT MICROORGANISMS IN PERMAFROST

A. Ye. Kriss 10 Feb. 1964 16 p refs Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 9, no. 9-10 1940 p 879-887

(FTD-TT-63-929/1+2; AD-436794)

A detailed account is presented of the collecting of samples of permafrosts of various ages and compositions and of the subsequent microbiological assays of each. The samples were collected from the frozen state and active layer on Kolyuchin Island and Vrangel Island in the eastern regions of the Arctic. Kolyuchin Island frozen-ground microflora consisted of a nonsporiferous bacillus, sporiferous bacteria, and actinomycetes; the active layer contained fungi as well. Vrangel Island frozen ground did not yield any microorganisms except from a frozen peat layer; the active layer consisted of nonsporiferous and sporiferous bacteria, actinomycetes, and fungi. Planned investigations on a larger scale are necessary before any conclusions can be drawn about the survival limits of microorganisms under the effect of constant negative temperatures.

M.P.G.

N64-29032 Joint Publications Research Service, Washington, D.C.

STUDIES IN SELF-PURIFICATION OF CESIUM-137 FROM RESERVOIR WATER AND IN SOME SPECIES OF ALGAE

21 Aug. 1964 35 p refs Transl into ENGLISH from Byul. Mosk. Obschestva Ispytatelei Prirody, Otd. Biol. (Moscow), v. 69, no. 3, May-Jun. 1964 p 20-24, 110-126
(JPRS-26056; TT-64-41326) OTS: \$2.00

CONTENTS:

1. SELF-PURIFICATION OF CESIUM-137 FROM WATER IN WEAKLY RUNNING RESERVOIRS AT VARIOUS SPEEDS OF FLOW. VOLUMES OF WATER, AND CONCENTRATIONS OF CESIUM A. L. Agre, I. V. Molchanova, and N. V. Timofeyev-Resovskiy p 1-8 refs (See N64-29033 21-16)

2. BIOCHEMICAL INVESTIGATION OF SOME ALGAE SPECIES M. V. Pakhomova p 9-27 refs (See N64-29034 21-16)

N64-29033 Joint Publications Research Service, Washington, D.C.

SELF-PURIFICATION OF CESIUM-137 FROM WATER IN WEAKLY RUNNING RESERVOIRS AT VARIOUS SPEEDS OF FLOW. VOLUMES OF WATER, AND CONCENTRATIONS OF CESIUM

A. L. Agre, I. V. Molchanova, and N. V. Timofeyev-Resovskiy *In its Studies in Self-Purification of Cesium-137 from Reservoir Water and in Some Species of Algae* 21 Aug. 1964 p 1-8 refs (See N64-29032 21-16) OTS: \$2.00

Data are presented from experiments on the biological purification of water (cesium¹³⁷ removal) and the distribution of cesium among the components of water reservoirs (water, earth, biomass) as a function of hydrodynamic factors, namely, the speed of water flow, dilution, and the concentration of cesium in the water. It is indicated that the greatest cleansing effect is achieved in the case where a concentrated cesium solution is fed into the system; the flow speed is low; and the volume of water passing through the system is small (dilution factor). I.V.L.

N64-29034 Joint Publications Research Service, Washington, D.C.

BIOCHEMICAL INVESTIGATION OF SOME ALGAE SPECIES

M. V. Pakhomova *In its Studies in Self-Purification of Cesium-137 from Reservoir Water and in Some Species of Algae* 21 Aug. 1964 p 9-27 refs (See N64-29032 21-16) OTS: \$2.00

A study was made of the total chemical composition of 20 algae. The greatest amount of total nitrogen, protein, and nucleic acids is contained in unicellular green, blue-green, and euglenoid algae. Diatomaceous algae are characterized by a high content of "crude fat." The bulk of the organic substance in large green and brown algae is in the form of carbohydrates. The composition of the proteins, amino acids, and carbohydrates of certain of these algae was also studied. I.V.L.

N64-29073 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

HUNGARIAN RADIOLOGY Selected Articles

28 May 1964 32 p Transl. into ENGLISH from Magyar Radiol. (Hungary), v. 5, no. 4, 1963 p 193-200, 208 214 (FTD-TT-64-163/1+3+4, AD 442436)

CONTENTS:

1. BIOLOGICAL-CHEMICAL PROTECTION FROM RADIATION F. Toth p 1-15 (See N64-29074 21-16)

2. PRACTICAL ORGANIZATION OF RADIATION PROTECTION J. Barany p 16-34 (See N64-29075 21-16)

N64-29074 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

BIOLOGICAL-CHEMICAL PROTECTION FROM RADIATION Ferenc Toth *In its Hung. Radiol.* 28 May 1964 p 1-15 (See N64-29073 21-16)

The use of ionizing radiation has made it necessary to study radioprotective measures. This paper presents a brief survey of the more important groups of radioprotective chemicals and also deals with the problem of the effect mechanism of such radioprotective substances. It also touches on problems involved in the use of the marrow transfusion. Author

N64-29075 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

PRACTICAL ORGANIZATION OF RADIATION PROTECTION

Janos Barany *In its Hung. Radiol.* 28 May 1964 p 16-34 (See N64-29073 21-16)

The basic principle of radiation protection can be defined quite simply: people should not be exposed to unnecessary radiation effects. This report surveys the possibilities presented by various practical solutions. Since informative work and persuasive techniques have produced almost no results in furthering radioprotection, it is clear that this protection can be realized effectively only through action by governmental authorities. Their main objective should be to see to it that X-raying is performed only after the results of all other clinical tests are in, and only when indicated by them, except for cases of immediate lethal danger. Unwarranted X-raying should be taken as a cause for disciplinary action. Should this method of control prove inadequate, it would seem appropriate to set up a control department within the framework of the National Radio-protection Institute, which would make on-the-spot investigations of X-ray practices. Courses on radioprotection should be set up for radiologists, and consulting physicians should be given refresher courses. In addition, reeducation of workers with radiation (technicians, etc.) should be required. I.V.L.

N64-29090 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

THE REACTION OF THE CARDIOVASCULAR SYSTEM OF MAN AND ANIMALS UNDER WEIGHTLESS CONDITIONS

R. M. Bayevskiy and O. G. Gazenko *In its Cosmic Res.* v. 2, no. 2 8 Jun. 1964 p 212-232 refs (See N64-29076 21-01)

Material is presented on the study of the cardiovascular system, conducted on the second and third spaceships and on the Vostok ships. The phasic nature of the reaction of the blood circulation system is established. It is shown that shifts of the functional condition of the heart and vessels can be caused by a decrease in the organism's demands on the cardiovascular system under weightless conditions and by changes in nerve regulation. Data affirm a decrease in the myocardial work level and an increase in asynchronism in the activity of the right and left heart. It is concluded that the tonus of the parasympathetic nervous system is enhanced under weightlessness. Questions about the value of studying blood circulation for insuring space flight safety are discussed. Author

N64-29091 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

THE EFFECT OF SPACE FLIGHT FACTORS ON MICRO-SPORES OF TRADESCANTIA PALUDOSA ON BOARD VOSTOK 5 AND VOSTOK 6

N. L. Delone, V. F. Bykovskiy, V. V. Antipov, G. P. Parfenov,
V. G. Vysotskiy et al *In its Cosmic Res.*, v. 2, no. 2 8 Jun.
1964 p 233-251 refs (See N64-29076 21-01)

To differentiate the effect of the dynamic flight factors from those of weightlessness and cosmic radiation on the hereditary structures of *Tradescantia paludosa*, cosmonaut V. F. Bykovskiy fixed the test material 1.5, 76, and 120 hr after launch. Analysis of the experimental data showed that three types of changes arose in *Tradescantia* microspores as a result of the flight—chromosomal aberrations, destruction of the mitotic mechanism, and stimulation of cell growth processes. A hypothesis is proposed that chromosomal aberrations result from the dynamic factors and that destruction of the mitotic mechanism is due mainly to the effect of weightlessness.

Author

N64-29092 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

GROWTH OF ORGANISMS UNDER WEIGHTLESSNESS
G. P. Parfenov *In its Cosmic Res.*, v. 2, no. 2 8 Jun. 1964
p 252-260 refs (See N64-29076 21-01)

This report describes the methods and results of the first test on impregnation, reproduction, and development of *Drosophila* under conditions of weightlessness. Data are presented on the density of experimental cultures, ratio of sexes, presence of morphosis in individuals that had developed under conditions of weightlessness, and on the frequency of recessive lethals in their gametes. It is demonstrated that for certain organisms the condition of weightlessness does not present a substantial obstacle to impregnation and embryonic development.

Author

N64-29093 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

THE CAUSES OF GERM CELL MORTALITY IN DROSOPHILA AFTER FLIGHTS ON VOSTOK 3 AND 4
G. P. Parfenov *In its Cosmic Res.*, v. 2, no. 2 8 Jun. 1964
p 261-271 refs (See N64-29076 21-01)

In addition to new data on dominant lethal mutations in males, this report contains information on the frequency of this type of mutation in females. The frequency of dominant lethals does not increase in male gametes. The slight increase in egg deaths in the test groups is explained by the less energetic sexual behavior of the males after space flight. The observed increase of dominant lethals in female gametes does not have the character of a radiation effect.

Author

N64-29194 Republic Aviation Corp., Farmingdale, N.Y.
Space Environment and Life Sciences Lab.

STUDY OF THE NORMAL FECAL BACTERIAL FLORA OF MAN Quarterly Progress Report, Apr. 1-Jun. 30, 1964
Lorraine S. Gall [1964] 7 p
(Contract NASw-738)
(NASA-CR-58287; RAC-931-4) OTS: \$1.10 ph

The physiology of many of the predominating type of cultures isolated from the feces of adult male subjects is being studied. The carbohydrate fermentation of the feces was studied, with a particular attention being paid to lactic acid production, manometric estimation of metabolic end products, and isolation of predominating fecal bacteria.

P.V.E.

N64-29202 Esso Research and Engineering Co., Linden, N.J.
DEVELOPMENT OF HYDROCARBON ANALYSES AS A MEANS OF DETECTING LIFE IN SPACE Quarterly Report

W. G. Meinschein 1 Jul. 1964 24 p refs
(Contract NASw-508)
(NASA-CR-58500) OTS: \$2.60 ph

Irradiation of solid methane with γ -rays yields liquid alkanes that have lower mean molecular weights, less structural order, and smaller n-paraffin contents than biological or sedimental alkanes. Bacteria and kelp contain hydrocarbons that are chromatographically equivalent to 2,6,10-trimethylpentadecane, pristane, phytane, and 2,6,10,14-tetramethylheptadecane. Benzene extracts of a 2.5 billion-year-old Sudan sediment are rich in free sulfur and alkanes. Distributions of alkanes in the wash and extracts of the Sudan rock indicate an indigenous origin and a natural fractionation of these compounds. Pristane and phytane are apparently present in high concentrations in the hydrocarbons from the Sudan chert and Murray meteorite.

Author

N64-29206 National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

CREW PERFORMANCE DURING REAL-TIME LUNAR MISSION SIMULATION

Howard G. Hatch, Jr., Joseph S. Algranti; Donald L. Mallick, Harold E. Ream, and Glen W. Stinet (NASA Ames Research Center) Washington, NASA, Sep. 1964 48 p refs
(NASA-TN-D-2447) OTS: \$1.25

In order to study the performance of a crew in prolonged space flight, a simulation was made of a lunar landing mission beginning with launch from earth and terminating after earth reentry. Three trained test pilots, enclosed in two interconnected mockups of a command module and a lunar orbit rendezvous vehicle, flew three realistically simulated missions. Piloting performance was evaluated by comparison of accuracies achieved during the simulated missions with the base-line data obtained during training. The areas evaluated included crew proficiency in normal mission duties, crew alertness to emergency situations, the effects of duty cycles and physical conditioning, and crew psychophysiological reaction.

Author

N64-29247 Applied Science Associates, Inc., Valencia, Pa.
DEVELOPMENT OF AN IMPROVED METHOD OF TASK ANALYSIS AND BEGINNINGS OF A THEORY OF TRAINING

John D. Folley, Jr. 22 Jun. 1964 44 p refs
(Contract N61339-1218)
(NAVTRADEV CEN-1218-1; AD-445869)

The purpose of this study was to devise an effective method of task analysis that would fit in with a larger program of training-device development. Four major results were obtained: (1) a set of guidelines for task analysis that include background material thought to be useful to the task analyst (e.g., the nature of the task analysis and the nature of the task analyst); an overview of the process of task analysis; samples of forms to be used in task analysis; instructions on what information to obtain, how to get it, and where and how to record it; and examples of completed portions of a task analysis; (2) a system of interrelated definitions, constructs, and hypotheses relating task attributes to training requirements; and (3) recommendations for further research to improve task analysis and training situation analysis

I.V.L.

N64-29277 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

STUDYING THE PSYCHOLOGICAL ASPECTS OF MAN'S RELIABLE FUNCTIONING IN COSMIC FLIGHT

M. I. Bobneva 6 Aug. 1963 22 p refs Transl. into ENGLISH from Vopr. Psichologii (Moscow), no. 2, 1963, p. 173-180
(FTD-TT-63-761/1+2; AD-420604)

This report covers the following areas: (1) engineering psychology and problems of stress and dependability; (2) the cosmonaut-operator of a technical system; (3) work under conditions of time loss and in the presence of many sources

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of information; (4) reliability and information when the operator is overloaded with information, and compensatory processes; (5) reliability and information when the operator is underloaded with information, and compensatory processes; and (6) dependability and distribution of functions between man and machine.

I.v.L.

N64-29278 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

STUDY OF THE TENSION OF OXYGEN IN THE TISSUE OF THE LIVE BRAIN DURING EXTENDED ACCELERATION

Ye. A. Kovalenko, V. L. Popkov, and I. N. Chernyakov 3 Sep. 1963 10 p refs Transl. into ENGLISH from Byull. Eksperim. Biol. i Med. (Moscow), No. 1, 1963 p 43-47
(FTD-TT-63-848/1+2: AD-420759)

Polarographic determinations of oxygen tension were made, with the aid of platinum electrodes implanted in the brain tissues of a dog, for the study of hypoxia. Overloads were caused by whirling the animals, on a centrifuge, in different directions. The time of action of the overload amounted to 1 minute; the intensity of the overload was from 2 to 12 g. Altogether, 156 turns were made on the dogs. The action of the overload in the head-to-pelvis, pelvis-to-head, and spine-to-breast directions was studied. The most pronounced changes in oxygen tension were observed during the action of the overloads in the directions of head-to-pelvis; second in line was the pelvis-to-head. Very little change, comparatively speaking, was noted in the oxygen tension in the case of transverse loads (spine-to-breast). This decrease in oxygen tension with all kinds of overloads, and especially in the case of overloads in the direction head-to-pelvis, indicates that oxygen starvation is one of the basic factors in the pathogenesis of breakdowns brought about by accelerations. These breakdowns pertain, particularly, to disorders of hemodynamics and respiration.

I.v.L.

N64-29280 HRB-Singer, Inc., State College, Pa.

THE ENHANCEMENT OF FIRE CONTROL TECHNICIAN PROFICIENCY BY THE USE OF TRAINING DEVICES
T. P. Enderwick, J. M. Mc Kendry, and M. S. Mc Kendry Apr. 1964 182 p refs
(Contract N61339-1105)

(NAVTRADEVCECEN-1105-1: AD-446397)

This report considers the question of how instructional devices can be used to increase the proficiency of individuals assigned the task of maintaining complex electronic fire-control equipment in the fleet (FTs). This question was studied in relation to particular equipments comprising the Mark 68 fire-control system. However, where possible, an attempt was made to generalize findings to other fire-control systems.

Author

N64-29286 School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

BASELINE VALUES FOR AN INTRAMUSCULAR ACTH TEST BASED ON PAROTID FLUID FREE 17-HYDROXY-CORTICOSTEROID LEVELS

Ira L. Shannon, John R. Prigmore, and Steven C. Beering Jul. 1964 8 p refs
(SAM-TDR-64-37: AD-446149)

In 206 healthy young adult males, the intramuscular administration of 40 units ACTH-gel produced significant increases in parotid fluid 17-hydroxycorticosteroid levels 1 and 2 hours after dosage. Assay of the parotid fluid steroid is presented as a nonstress screening procedure in evaluating adrenocortical function. These data are offered as physiologic baselines for comparison in suspected adrenal disorders.

Author

N64-29287 School of Aerospace Medicine, Brooks AFB, Tex.

POLAROGRAPHIC DETERMINATION OF OXYGEN CONTENT AND CAPACITY IN A SINGLE BLOOD SAMPLE
Domenic A. Maio and James R. Neville Jul. 1964 12 p refs
(SAM-TDR-64-39: AD-446150)

A technique for polarographically determining oxygen content of blood was described in an earlier report. The results obtained by using this method compare favorably with those obtained by using the Van Slyke technique. Moreover, the method permits the accurate, rapid determination of oxygen content in small samples of blood. As with the Van Slyke technique, total oxygen capacity was formerly estimated by a separate determination of the oxygen content after complete saturation with oxygen of another portion of the blood sample. Further experience with the method has revealed the feasibility of estimating both content and capacity in a single blood sample. The capacity estimate is made possible by the polarographic observation of the quantity of potassium ferricyanide required to convert ferrohemoglobin to ferrihemoglobin. The measurement of oxygen content is performed by the polarographically determined increase in physically dissolved oxygen caused by the release of bound oxygen. By this means, sampling and random errors inherent in the use of two separate determinations are avoided. The method requires only a brief time for performance and ordinary technical proficiency. It is also exceedingly simple in application.

Author

N64-29288 School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.

CEREBRAL ARTERIOVENOUS DIFFERENCES IN METABOLIC SUBSTRATES DURING HYPERTERMIA
Harry M. Frankel and Stephen M. Cain Aug. 1964 12 p refs
(Contract AF 41(609)-1499)
(SAM-TDR-64-44: AD-446151)

The effect of a progressive increase in rectal temperature on arterial and cerebral sagittal sinus blood lactate, pyruvate, glucose, and bicarbonate concentrations, as well as on pH, PCO₂, PO₂, and hemoglobin saturation (% Hb sat) were studied in 8 dogs. There was no consistent pattern of increase in calculated cerebral excess lactate (XL) at temperatures lower than that at which arterial XL was reported to appear in the blood. Minimum cerebral sagittal sinus PO₂ and % Hb observed were 35-mm Hg and 35%, respectively. The conclusion was made that the brain did not become hypoxic before the other tissues of the body.

Author

N64-29339 National Aeronautics and Space Administration, Washington, D.C.

SPACE MEDICINE: SCOPE, PROGRESS AND APPLICABILITY TO OTHER MEDICAL FIELDS
S. P. Vinograd Repr. from Postgraduate Med., v. 36, no. 2, Aug. 1964 p95-102 refs
(NASA-RP-306)

Space medicine concerns itself with normal man in an abnormal environment. Its contributions to medical science include information about radiation; increased knowledge of physiologic responses, and improved bioinstrumentation and analysis and data storage techniques. Bioinstrumentation may be the key to earlier diagnosis of many pathologic conditions. A brief review is given of problems peculiar to space medicine, and a summary is made of its progress as a national program.

A.W.

N64-29538 Massachusetts Inst. of Tech., Cambridge Research Lab. of Electronics

A THEORY OF PASSIVE ION FLUX THROUGH AXON MEMBRANES

J. Y. Lettvin, W. F. Pickard, W. S. McCulloch, and W. Pitts Repr. from Nature (London), v. 202, no. 4939, 27 Jun. 1964 p 1338-1339 refs
 (Grants NSG-496; NIH MH-04737-03; NSF G-16526; Contracts DA-36-039-AMC-03200(E); AF 33(616)-7783)

A lock-and-key model is proposed to explain passive ion flux through the membranes of unmyelinated nerve axons. Among the assumptions made are these: (1) Mass transport across the living axon membrane is by way of the small channels or pores in the bimolecular leaflet membrane. (2) Anions and cations pass through different channels. The cation channels are of two types—a potassium channel that is large enough to pass hydrated K^+ but not hydrated Ca^{++} , and a sodium-calcium channel that is large enough to pass hydrated Ca^{++} with difficulty and hydrated K^+ and Na^+ with ease. (3) A hydrated ion is able to lock a channel either by covering one end and electrostatically binding there or by entering a channel and binding electrostatically to its walls. (4) An ion is able to function as a key for a locked channel by tumbling the locking ion out of the channel and replacing it as the channel lock. (5) Each variety of hydrated ion will be unique in its ability to lock and unlock the channel because of its unique electrical and steric properties. Predictions as to how the given ions will act are made, and it is suggested, on the basis of this model, that La^{+++} should function as a nerve-blocking agent. The suggestion is also made that the efficacy of many local pain killers may be due to a superficially similar blocking action on ion fluxes.

M.P.G.

N64-29546 Allied Research Associates, Inc., Concord, Mass.
A REVIEW OF BIOLOGICAL MECHANISMS FOR APPLICATION TO INSTRUMENT DESIGN Second Summary Report

J. Healer, H. Homonoff, C. Jamieson, D. Kimura, S. Koslov et al Dec. 1963 315 p refs
 (Contracts NASr-16; NASw-535)
 (NASA-CR-58560, ARA-T-9211-5, Vol. 1)

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N64-29557 Ling-Temco-Vought, Inc., Dallas, Tex. Astrodynamics Div.

A PRELIMINARY DESIGN GUIDE OF HUMAN ENGINEERING CRITERIA FOR MAINTENANCE AND REPAIR OF ADVANCED SPACE SYSTEMS (HECMAR)

R. D. Hutchison and R. C. James, Jr. 19 Jun. 1964 311 p refs

(Contract NAS9-1670)

(NASA-CR-58575; Rept.-00474) OTS: \$19.75 ph

Among the products of this phase of study was the development of a preliminary design guide based upon those existing design criteria that may have applicability to the space environment, to intravehicular and extravehicular maintenance, and to currently conceived space vehicles. Emphasis was placed on detail design factors and criteria and on those human aspects that are most likely to be modified by man's experience and performance in a pressure suit. The most likely factors to be modified by suit condition are body dimensions, mobility, reach capabilities, force capabilities, speed of response, and psychomotor skills. The area of sensory capabilities was limited to visual problems in space, noise protection, and speech intelligibility in a noise field. In bioastronautics, emphasis was placed upon the behavioral implications of environmental parameters rather than upon physiological limits and tolerances. Force capabilities under weightlessness were considered. This preliminary design guide presents the design criteria in the form of requirements and prohibitions rather than in statements of principle.

I.V.L.

N64-29559 IIT Research Inst., Chicago, Ill. Life Sciences Div.

SURVIVAL OF MICROORGANISMS IN A SIMULATED MARTIAN ENVIRONMENT. I: *BACILLUS SUBTILIS* VAR. *GLOBIGII*

C. A. Hagen, E. J. Hawrylewicz, and R. Ehrlich Repr. from Appl. Microbiol., v. 12, no. 3, May 1964 p 215-218 refs

(Contract NASr-22)

Survival of *Bacillus subtilis* var. *globigii* in a simulated Martian environment was demonstrated. Previous contact with the simulated Martian soil or atmosphere reduced germination or outgrowth of unheated spores, or both. Inoculation into simulated Martian soil and then flushing with a simulated Martian atmosphere were lethal to both vegetative cells and spores. After one diurnal temperature cycle (26° to -60° C), the majority of cells present were spores. No further effect of the diurnal cycle on survival was noted in any of the experimental samples

Author

N64-29573 Avco Corp., Tulsa, Okla.

STUDY OF THE CORRELATION BETWEEN LINEAR ENERGY TRANSFER AND RELATIVE BIOLOGICAL EFFECTIVENESS Final Report, Jul. 1963-Aug. 1964

K. M. Hoalst et al [1964] 70 p refs

(Contract NASw-782)

(NASA-CR-58289) OTS: \$6.60 ph

The instruments developed for this program include small tissue equivalent proportional counters for measuring LET

spectra over a wide range of radiation intensities and tissue equivalent ionization chambers for the direct measurement of radiation absorbed dose in tissue. In the biological system development, living tissue was simulated by compacting haploid yeast cells (strain Sc-7) in solid polyethylene glycol. The compacted mass of cells was irradiated, and serial sections were taken to assay radiation damage at various depths. The ability of the irradiated cells to produce a macroscopic colony on suitable nutrient material was a measure of cell survival. Radiation exposures were made with 22.3 Mev and 210 Mev protons, and the results were compared with 200 KVCP X-ray irradiation results.

Author

N64-29583 Naval School of Aviation Medicine, Pensacola, Fla.

THE EFFECT OF VIBRATION AND RESTRAINT ON BODY WEIGHT AND SURVIVAL OF THE ALBINO RAT

Donald E. Fury 19 Sep. 1963 10 p refs
(Rept.-5; AD-426475)

The effects of whole body vibration at a constant frequency (25 cps) and displacement (0.25 in.) were studied using male Sprague-Dawley rats. Primary emphasis was placed on the determination of lethal exposure time. In addition, the effect of restraint, variation in body weight, and determination of a non-lethal stress condition were evaluated. The mean survival time of restrained animals was 116 minutes, with the major gross pathological finding being pulmonary hemorrhage. Incidental findings included gastrointestinal and myocardial hemorrhage in the animals exposed to a lethal vibration stress. Mean net body weight loss was calculated for restrained animals vibrated only 30 minutes as 1.7 grams as compared to 0.2 gram in a group of nonvibrated animals restrained for 30 minutes. Non-fatal vibration stress of 6-hours' duration applied to nonrestrained rats resulted in a mean net body weight loss of 21.4 grams.

Author

N64-29594 Massachusetts Inst. of Tech., Cambridge

EVOKED RESPONSES FROM THE AUDITORY CORTEX

Donald C. Teas and Nelson Y-s Kiang (Mass. Eye and Ear Infirmary) Repr. from Exptl. Neurol., v. 10, no. 2, Aug. 1964 29 p refs
(Grants NsG-496; NSF G-16526; NIH MH-04737-03; NIH G-B-1344)

Evoked responses were recorded from the auditory cortex of unanesthetized cats. With clicks of moderate intensity, the waveforms of the responses were highly repeatable among awake cats. Introduction of certain variables, such as localized injury to cortex, anesthesia, or sleep, resulted in more or less characteristic changes in the waveform of the evoked responses. In particular, the later components of the responses seemed to be more sensitive to changes in the state of the animal, while the early components seemed to be abolished by local injury to the cortex. The evoked responses and particularly the later components did not always behave in a reliably repeatable fashion as click intensity or click rate was changed.

Author

N64-29650 National Academy of Sciences-National Research Council, Washington, D.C. NRC Committee on Vision
VISUAL REQUIREMENTS FOR FLYING: SOME ASPECTS OF RE-EVALUATION Report of Working Group 20

Arthur Jampolsky and Ailene Morris Jun. 1964 27 p refs
(Contract Nonr-2300(05);
(AD-442707)

The conclusions and recommendations of a working group to reevaluate the visual requirements for flying are presented. Among the conclusions drawn are these: (1) Increased flexibility and refinement of the visual classification system are required. (2) The feasibility and actual need for extensive valida-

tion of visual standards in terms of specific performance are questioned. (3) Communication is inadequate, and the liaison is poor between operational visual specialists and visual scientists. Among the recommendations are the following: (1) to state the capabilities in each of the major visual parameters in grades of visual fitness as a basis for a flexible dynamic system of visual standards; (2) to create a core team of operational visual specialists and visual scientists to carry out the grades of visual fitness concept; (3) to define perfection in each of the visual parameters; (4) to evaluate and recommend improved visual testing techniques; (5) to recognize the value of pooled, expert judgment in lieu of elaborate validation studies; and (6) to organize questions and data according to the principles of taxonomic classification, in order to facilitate communication between operational and scientific personnel. Methods and principles of taxonomic classification applied to human visual data are included in a supplement.

M.P.G.

N64-29659 Illinois U., Urbana

THREE-WAY FACTOR ANALYSIS OF A MULTITRAIT-MULTIMETHOD MATRIX

Edward L. Hoffman and Ledyard R. Tucker Feb. 1964 40 p refs
(Contract Nonr-1834(39))
(AD-600302) OTS: \$1.00

Analytical procedures, developed from Tucker's model for the analysis of three-way matrices of data, were applied to a multitrait-multimethod correlation matrix of rating-scale data from the Kelly and Fiske study of Veteran's Administration trainees. Ratings of the trainees on 15 of the original 22 variables, by the assessment staff, by the trainees' teammates during the assessment period, and by the trainees themselves, were analyzed for 124 male trainees. A major conclusion drawn from the findings is that, as applied to this set of data, Tucker's model appears to be more powerful than previously used methods, since it discloses the intrinsic structure existing in the observational mode of the data, while providing a quantitative description of the interrelationships among these intrinsic structures.

D.E.W.

N64-29663 Detroit U., Mich.

PORPHINE-LIKE SUBSTANCES: PROBABLE SYNTHESIS DURING CHEMICAL EVOLUTION

Anton Szutka Repr. from Nature, v. 202, no. 4938, 20 Jun. 1964 p 1231-1232
(Grant NsG-226)

Experiments were conducted wherein an aqueous suspension of pyrrole and benzaldehyde was irradiated at room temperature with either ultraviolet or visible light. In addition, an aqueous suspension and a solution in pyridine of pyrrole and benzaldehyde were placed in semidarkness without irradiation. In all cases a porphine-like product, that is, $\alpha,\beta,\gamma,\delta$ -tetraphenylporphine was obtained. Results of these experiments indicate that the presence of water, or rather the suspension of the organic matter in water, increased the yield of porphine-like substances considerably. The increase observed in the yield of porphine-like substances, on standing, show that a process of autocatalysis takes place. In addition, evolutionary selection pressure was exerted for the synthesis of porphine-like substances as soon as the reductive atmosphere was converted into an oxidative one. Simultaneously, with the change of a reductive atmosphere to an oxidative one, due to the photolysis of water, hydrogen peroxide also appeared. In order to continue chemical evolution, it was necessary to develop a mechanism for the destruction of the large amounts of hydrogen peroxide. These mechanisms are described.

I.V.L.

N64-29673 Notre Dame U., Ind.

CHRONIC EFFECTS OF IONIZING RADIATION ON THE HEMATOPOIETIC SYSTEM Final Technical Report
Charles E. Brambel 1 Jul. 1964 482 p refs
(Contract DA-49-007-MD-955)
(AD-602135)

Frequent quantitative measurements were made of the cellular composition of blood and blood-forming tissues and of the major protein components of serum. Massive recovery of splenic erythropoiesis under continuous radiation exposure, in the absence of marrow recovery, was noted. This pointed to a potential role of the spleen for survival under the experimental conditions used, and comparisons of splenectomized with nonsplenectomized animals were also performed. Author

N64-29676 Tufts U., Medford, Mass. Inst. for Psychological Research

HUMAN ENGINEERING BIBLIOGRAPHY, 1961-1962
Paul G. Ronco et al Washington, ONR, Oct. 1963 398 p refs
(Contract Nonr-494(13))
(ONR-ACR-86; AD-602386) OTS: \$5.00

This bibliography comprises the following: (1) a topical outline that defines over 300 topic headings established for this bibliography; (2) an alphabetic index of the common search terms that would aid those using this bibliography but who are unfamiliar with the topic headings; (3) an annotated bibliography of some 1,745 citations; and (4) an index of the authors of these citations.

Author

N64-29699 Houston U., Texas

PREBIOLOGICAL SYNTHESIS OF COMPONENTS OF NUCLEIC ACIDS [DOBIOLOGICHESKIY SINTEZ KOMPONENTOV NUKLEINOVYKH KISLOT]

Juan Oro Repr. from Probl. Evolyutsionnoy i Tekhn. Biokhim. (Moscow), Izd. Nauka [1963] p 63-69 Transl. into RUSSIAN of an Article from Ann. N.Y. Acad. Sci., v. 108, 29 Jun. 1963 p 464-481 refs
(Grant NsG-257)

An investigation into the origin of living terrestrial organisms leads to the problems of the origin of albumen and nucleic acids, and of the prebiological organization of unicellular components of the biological macromolecules. The present article examines the nonenzymatic synthesis of the components of nucleic acids, and puts forth experimental evidence and theoretical considerations of the abiogenic organization of uridines, pyrimidines, and pentosribose and 2-deoxyribose.

Trans. by M.B.S.

N64-29722 Mississippi State U., State College

EXTRACELLULAR POLYSACCHARIDES OF ALGAE: EFFECTS ON LIFE-SUPPORT SYSTEMS

B.G. Moore and R. G. Tischer Repr. from Sci., v. 145, no. 3632, 7 Aug. 1964 p 586-587
(Grant NsG-80)

The amount of extracellular polysaccharide produced by eight species of green and blue-green algae ranges from 173 mg/liter to 557 mg/liter. Most of the polymers are composed of four monosaccharides: a hexose, a pentose, a methyl pentose, and uronic acid. The production of excessive amounts of these photosynthetic end products will undoubtedly influence the effective recycling time of growth media in life-support systems.

Author

N64-29725 California U., Berkeley Donner Lab.

CONDUCTION BLOCKAGE IN NERVE WITH HIGH ENERGY IRRADIATION

C. T. Gaffey Repr. from Radiation Res., v. 22, no. 1, May 1964 1 p
(NASA-Order R-104)

Experiments on conduction blockage, in the isolated sciatic nerve from *Rana pipiens*, with high-energy irradiation are reviewed. A massive dose (450,000 rad) of high-energy alpha particles and protons produced an immediate and irreversible blockage of conduction when the whole nerve was irradiated. Lower doses of these high-energy particles were effective in inhibiting neural conduction. In other experiments, irradiation with 50-Mev protons and 120-Mev alpha particles was restricted to small lengths of the nerve. It was found that millions of rads of high-energy irradiation failed to induce blockage in conduction. Experiments were performed in which the segment of the nerve exposed to high-energy irradiation was increased in 0.279-mm steps. When 1 mm or less of the nerve was irradiated with two or three million rads of high-energy alpha particles and protons, there was a failure to block transmission. If more than 1.4 mm of the nerve was irradiated, there was an immediate interruption of conduction. The relevance of this finding to brain surgery was investigated.

I.v.L

N64-29730 National Aeronautics and Space Administration, Washington, D.C.

CERTAIN PROBLEMS AND PRINCIPLES OF THE FORMATION OF A HABITABLE ENVIRONMENT BASED ON THE CIRCULATION OF SUBSTANCES [NEKOTORYE PROBLEMY I PRINTSIPY FORMIROVANIYA OBITAYEMOY SREDY NA OSNOVE KRUGOVOROTA VESHCHESTV]
A.M. Genin and Ye. Ya. Shepelev Sep. 1964 10 p refs Transl. into ENGLISH of a Paper Presented at the 15th Intern. Astronautical Congr., Warsaw, 7-12 Sep. 1964
(NASA-TT-F-9131)

An examination is made of the organization of a closed ecological system as a new form of the unity of man and his environment under conditions of very limited space. In its basic layout, a system can be closed only in respect to one element, or parts thereof, and does remain open in respect to other substances being used from the supplies afforded. The possibility of chemical synthesis of certain nutritive substances is considered, and the conclusion is reached that some way must be found of transforming the indigestible part of the selected plants into digestible food containing animal proteins.

A.W.

N64-29742 Joint Publications Research Service, Washington, D.C.

CONTROL SYSTEMS IN ORGANIC NATURE AND THE GENERAL UNDERSTANDING OF LIFE PROCESSES
A. A. Lyapunov In its Probl. of Cybernetics, No. 10, 1963 10 Sep. 1963 p 282-302 (See N64-29733 21-20) OTS: \$7.40

This article contains three chapters as follows: (1) "The Cybernetic Approach to Theoretical Biology"; (2) "An Analysis of the Definition of Life"; and (3) "A Comparison of the Definition of Life with the Data of Biology."

I.v.L

N64-29751 United Aircraft Corp., Farmington, Conn. Systems Center

HUMAN ENGINEERING CONSIDERATIONS IN TACTICAL METEOROLOGICAL EQUIPMENT

Stephen D. Benson and Robert L. Hilgendorf Bedford, Mass., Electron. Systems Command, Jun. 1964 13 p Presented at the 10th Meeting of the Army Integrated Meteorol. System Coordinating Group, Waltham, Mass., 21 May 1964
(Contract AF 19(628)-3357)

(ESD-TDR-64-437; AD-602711) OTS: \$1.00

This report concerns human capabilities and limitations as they interface with the operation, maintenance, and control

of tactical meteorological equipment. It discusses several pieces of tactical meteorological equipment and relates to these equipment their major "human engineering" problems and concerns.

Author

N64-29759 Joint Publications Research Service, Washington, D.C.

STUDIES IN RADIATION SICKNESS TREATMENT

L. V. Orlova et al 24 Sep. 1964 16 p refs Transl. into ENGLISH LISH from Med. Radiol. (Moscow), v. IX, no. 6, Jun. 1964 p 19-21, 43-47

(JPRC-26542, TT-64-41800) OTS: \$1.00

Adrenocorticotropic hormone (ACTH) with prolonged action increased the survival of rats when administered for 6 days prior to irradiation, with daily doses of 0.25 to 1 unit. Preparation of lagochylus in treatment of acute radiation sickness induced by polonium should be used in combination with unithiol. In the conservative treatment of skin ulcers caused by radiation, cigerol is preferred to linol. A.W.

N64-29762 Matrix Corp., Arlington, Va.

USE OF AN ENGINEERING ANALOGY IN THE DEVELOPMENT OF TESTS TO PREDICT TRACKING PERFORMANCE

James F. Parker, Jr. Feb. 1964 60 p refs

(Contract Nonr-3065(00))

(AD-602861) OTS: \$3.00

This study attempted to describe performance in a complex perceptual-motor task (the criterion tracking task) in terms of a limited number of basic abilities. An engineering analogy of the criterion task was developed and was used to specify the basic activities involved. These, in turn, were used in hypothesizing a set of abilities believed to underlie task proficiency. Paper-and-pencil, electronic, and mechanical tests were constructed for each hypothesized ability, with the hope that these tests would serve as predictors of performance in the tracking task. One hundred subjects were measured on the predictor tests and were practiced in the tracking task for a total of 8 hours, distributed over 6 weeks. The seven factors that could be extracted from the derived matrix factor provided a considerable degree of validation of the engineering analogy. A time-sharing ability was identified, but was not found to relate to tracking performance. Three of the remaining factors did relate to tracking performance, accounting among them for approximately 50% of criterion task variance. Of these, the ability to operate foot controls measured motor responses. The ability to predict movement through time and the ability to analyze target movement measured the prediction responses.

I.V.L.

N64-29766 Flying Personnel Research Committee (Gt. Brit.) **THE BISENSORY PRESENTATION OF INFORMATION. PART I: A REVIEW OF EXPERIMENTS ON SENSORY INTERACTION**

John Brebner, (St. Andrews U.) London, Min. of Aviation, Apr. 1963 30 p refs

(FPRC/1209(a))

Investigations that have been carried out in the field of intersensory phenomena are reviewed, and areas of apparent conflict in results obtained and areas of agreement between disparate sets of results are pointed out. Topics covered include threshold and acuity alterations, auditory flutter and critical flicker fusion, dark adaptation, color vision, vigilance and simultaneous presentations, bisensory presentation of information, auditory localization, temporal considerations, and crossmodal comparisons.

P.V.E.

N64-29767 Flying Personnel Research Committee (Gt. Brit.) **THE BISENSORY PRESENTATION OF INFORMATION. PART II: THE EFFECT OF SIMULTANEOUS AUDITORY STIMULATION ON THE DETECTION OF VISUAL SIGNALS**

John Brebner (St. Andrews U.) London, Min. of Aviation, Jul. 1963 11 p refs

(FPRC/1209(b))

Experiments were conducted to ascertain whether the detection of weak visual signals was improved when they were accompanied by an auditory signal in a situation where a "liberal" strategy was inappropriate. The auditory signal was selected to have a detection probability of 1. Both auditory and visual signals were derived from the same source—a white-noise generator producing an output with a level spectrum over the audio band above 100 c/s. Three groups of six males acted as subjects. The mean-age of Group I was 20.5 years; that of Groups II and III was 20.3 years. In Group I, with signals 10 db down from their threshold level, bisensory presentation reduced the number of correct detections. In Group II, with signals 5 db down from their threshold level, the number of correct detections differed little between bisensory and unisensory detection. In group III, the detectability of visual signals was improved when they were accompanied by auditory signals at the suprathreshold level.

I.V.L.

N64-29768 Flying Personnel Research Committee (Gt. Brit.) **DECOMPRESSION SICKNESS AT 18,500 FEET. A CASE HISTORY WITH COMMENT**

D. I. Fryer (Inst. of Aviation Med., RAF) London, Min. of Aviation, Nov. 1963 8 p refs

(FPRC/Memo.199)

A pilot, aged 33 and considerably overweight, was exposed to an altitude of 18,500 ft in an unpressurized aircraft. After 2 hours he began to develop symptoms that progressed over 1 1/2 hours, by which time he had limb and joint pain, tightness of the chest, visual disturbance, headache, and general weakness. The symptoms improved on descent, but he collapsed shortly after landing at the completion of the 9 1/2-hour flight. He then developed a migraine-like syndrome. In addition he had skin mottling, irritability, symptoms in the central nervous system, hemo concentration, and a raised CSF protein. His condition slowly returned to normal over the following 3 to 4 days.

Author

N64-29794 Illinois U., Urbana Aviation Psychology Lab. **EFFECTS OF VISUAL DISPLAY MODE ON SIX HOURS OF VISUAL MONITORING**

Carl E. Webber and Jack A. Adams Brooks AFB, Tex., School of Aerospace Med., Jun. 1964 14 p refs

(Contract AF 41(609)-1481)

(SAM-TDR-64-34; AD-604466)

An experiment was performed to assess the effects of visual display mode and 6 hours of monitoring on performance in a complex vigilance task. The task had 12 stimulus sources arrayed over 60 degrees, and numeric signals that persisted for 6 seconds. Each group of 15 subjects had a different display configuration: normally off, normally on, and normally on with visual noise. Display mode influenced overall mean performance, but not vigilance decrement. The amount of vigilance decrement was small despite the long session, and its magnitude was essentially the same as previous studies with sessions of 2- to 3-hours' duration. Findings supported earlier conclusions about the triviality of vigilance decrement when tasks are complex.

Author

N64-29814 Massachusetts U., Amherst Inst. of Environmental Psychophysiology
THE EFFECT OF VARIOUS MODES OF REHEARSAL ON SHORT-TERM RECALL
 Mary Eleanor Lewis and Warren H. Teichner 11 Jun. 1964
 27 p refs
 (Contract N611339-1303)
 (NAVTRADEVCECEN-1303-1; AD-605387)

This report is one of 3 evaluations of different proposed methods for increasing the ability of individuals to report the contents of briefly exposed alphabetic displays. In this case, study was made of the effects on short-term recall of the last and next-last display in a rapid series of the following modes of rehearsal: (1) silent rehearsal; (2) vocal rehearsal; (3) manual rehearsal; and (4) combined vocal-manual rehearsal. The results suggested that rehearsal aids when memory is severely stressed, as for recall of the next-last display, and that vocal rehearsal is superior to the other modes studied. The military implications of the results are discussed. Author

N64-29846 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
A METHOD FOR THE MEASUREMENT OF PHYSIOLOGIC EVAPORATIVE WATER LOSS
 Thomas Adams, Gordon E. Funkhouser, and Warren W. Kendall (Okla. U.) Oct. 1963 18 p refs
 (CARI-63-25; AD-603418)

This report describes a technique for measuring local sweat responses, which is relatively inexpensive, highly stable, and accurate. Basically, the system uses a thermal conductivity cell for the detection of water vapor in an air stream passing over the skin. A method for calibration of the unit and examples of its application in physiological and psychological testing are described. Author

N64-29847 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
TASK-CONTROL OF AROUSAL AND THE EFFECTS OF REPEATED UNIDIRECTIONAL ANGULAR ACCELERATION ON HUMAN VESTIBULAR RESPONSES
 William E. Collins Nov. 1963 28 p refs
 (CARI-63-29; AD-603419)

Subjects were exposed to a 10-day habituation series of 200 CW accelerations in total darkness while performing attention-demanding tasks. Decelerations were subthreshold. Preliminary and post-tests indicated that slow-phase nystagmus and duration of the ocular response declined bidirectionally as a function of the habituation trials, but frequency of nystagmus increased during the stimulus period and for a few seconds thereafter. These changes were approximately equal for both CW and CCW stimulation. A decline in the intensity of the sensation to CW acceleration, but not to CCW stimulation, was produced by the habituation series. Author

N64-29848 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
PROBLEMS IN AIR TRAFFIC MANAGEMENT. IV. COMPARISON OF PRE-EMPLOYMENT, JOB-RELATED EXPERIENCE WITH APTITUDE TESTS AS PREDICTORS OF TRAINING AND JOB PERFORMANCE OF AIR TRAFFIC CONTROL SPECIALISTS
 David K. Trites and Bart B. Cobb Dec. 1963 13 p refs
 (CARI-63-31; AD-603416)

In general, experience most directly related to air traffic control work was a positive predictor; experience related to

communications and piloting was negative. It was also shown that for enroute trainees only, a composite variable (ΣAT) representing the sum of tower GCA, RAPCON/RATCC, and center experience had a statistically significant, but small, relationship with ratings of job performance. In contrast, aptitude tests were superior to the experience variables for the prediction of all training course performance measures of both types of trainees, with the exception of laboratory performance of terminal trainees. Author

N64-29849 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
WORK TOLERANCE: AGE AND ALTITUDE
 D. B. Dill, S. Robinson, B. Balke, and J. L. Newton Dec. 1963 10 p refs
 (CARI-63-33; AD-603932)

The work capacity of nine men has been measured on the treadmill and/or on the bicycle ergometer at sea level and at high altitude; five of these men were studied at intervals 18 to 33 years apart. The maximum capacity for oxygen intake declined with age, both at high altitude and at sea level. Individual responses varied greatly: the most fit individual, age 54, had about as great an oxygen intake on the ergometer at an altitude of 14,200 ft ($P_B = 455\text{-mm Hg}$) as had a man one-half his age at sea level. After 5 to 6 weeks of acclimatization a man of 71 attained at the elevation of 12,600 ft ($P_B = 485\text{-mm Hg}$) a greater oxygen intake per kg and per min than a man of 27. Author

N64-29850 Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Research Inst.
HUMAN FACTORS ASPECTS OF LIGHTPLANE SAFETY
 Richard G. Pearson Dec. 1963 15 p refs
 (CARI-63-35; AD-603931)

This paper attempts to relate aircraft accident investigation and aeromedical research efforts for the purpose of clarifying research needs. Such efforts ultimately can lead to a reduction in lightplane accidents, injuries, and fatalities. Recent statistical studies of lightplane crash injuries are summarized, and contributions that human biologists, physical anthropologists, and design engineers can make toward reducing or preventing injury in future crashes are discussed. Programs of biomedical and human engineering research as they relate to lightplane safety are described. Contributions that physicians can make to this program are outlined. Author

N64-29857 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.
CONTEMPORARY MEANS FOR EMERGENCY ABANDONMENT OF AIRCRAFT (SELECTED CHAPTERS)
 S. M. Alekseyev, Ya. V. Balkind et al 2 Jun. 1964 202 p refs Transl. into ENGLISH from the book "Sovremennyye Sredstva Avaryynogo Pokidaniya Samoleta" Moscow, Gosudarstvennoye Nauchno-Tekhn. Izd., Oborongiz, 1961 (FTD-TT-63-420/1+2; AD-602689)

Selected chapters from the book, "Contemporary Means for Emergency Abandonment of Aircraft," are presented. Chapters are: (1) "General Data on Contemporary Facilities for the Rescue of an Aircraft Crew under Emergency Conditions"; (2) "High-Altitude and Protective Equipment"; and (3) "Testing of Survival and Rescue Equipment." I.v.L.

N64-29871 Massachusetts U., Amherst Inst. of Environmental Psychophysiology

PERCEPTION AND SHORT TERM MEMORY UNDER WORK LOAD STRESS

Robert Seibel, Richard E. Christ, and Warren H. Teichner
11 Jun. 1964 33 p refs
(Contract N61339-1303)
(NAVTRADEVCECEN-1303-2; AD-604866)

The effect that systematically increasing the rate of input information has on short-term memory was investigated. It was found that relatively high levels of input-load stress did not lead to the expected breakdown in the critical memory task. The findings suggest that operators adapt to the high-input rates by encoding the data, i.e., imposing their own unique organization on the incoming material, thus facilitating assimilation and processing of large amounts of unconnected, meaningless material. One implication of these results is that greater attention should be focused on problems of storage and output processing (rather than on input rate) in training for and design of high-speed man-machine closed-loop systems.

M.P.G.

N64-29872 Chicago U., Ill. USAF Radiation Lab.
[CERTAIN BIOLOGICAL AND MEDICAL ASPECTS OF RADIATION] Quarterly Progress Report

Kenneth P. Du Bois 15 Jul. 1964 207 p refs
(Contract AF 41(609)-1693)
(QPR-52; AD-603561)

The three sections of this report, and papers presented under each section, are as follows: (1) The Effect of Ionizing Radiations on the Biochemistry of Mammalian Tissues—"The Influence of X-radiation and Various Chemical Agents on the Development of a Thiophosphate-Oxidizing Enzyme System in the Livers of Male Rats," "The Influence of X-irradiation on Steroid-Induced Increases in the Activity of a Detoxification Enzyme in Liver," and "Studies on the Toxicity and Mechanism of Action of 2-Mercaptoethylamine"; (2) Pharmaceutical and Toxicological Compounds as Protective or Therapeutic Agents against Radiation Injury in Experimental Animals—"The Influence of Various Chemical Compounds on Radiation Lethality in Mice," "Studies on Tissue Oxygen Levels and Radioprotection with Anoxia and Serotonin in Mice," and "Studies on the Toxic and Radioprotective Effects of Cyclobutane Derivatives"; and (3) The Influence of Exposure to Low Levels of Gamma and Fast Neutron Irradiation on the Life Span of Animals—"Histopathologic Findings in the Tissues of Mice Given Daily X-ray Exposures with or without Liver Shielding, and Hematological and Histopathological Findings in the Tissues of Mice Fed Diets Containing Para-aminopropiophenone and the Effect of Daily X-ray Exposure on these Findings."

I.V.L.

N64-29885 Portugal Nuclear Energy Commission, Sacavem De Fisica e Engenharia Nucleares

THE AUTORADIOGRAPHIC STUDY OF INCORPORATION OF TRITIATED THYMIDINE INTO HUMAN CHROMOSOMES. PART I: PRELIMINARY STUDIES [ESTUDO AUTORADIOGRAFICO DA INCORPORACAO DA TIMIDINA TRITIADA EM CROMOSOMAS HUMANOS. I: PRIMEIROS ENSAIOS]

A. A. Teixeira Pinto 1964 25 p refs In PORTUGUESE; ENGLISH summary Work done in conjunction with Lisbon U. (LFEN-NI.11 (α))

The incorporation of tritiated thymidine into the DNA molecule associated with the autoradiographic method is a well-established aid in the study of DNA synthesis. Some advantages and disadvantages in using tritiated thymidine in living cells are pointed out, and the tissue culture technique, as well as the autoradiographic method, are reported.

Author

N64-29906 California U., Berkeley Sanitary Engineering Research Lab.

A STUDY OF FUNDAMENTAL FACTORS PERTINENT TO MICROBIOLOGICAL WASTE CONVERSION IN CONTROL OF ISOLATED ENVIRONMENTS First Technical Report

C. G. Golueke, W. J. Oswald, and H. K. Gee 31 Mar. 1964 73 p refs
(Contract AF 19(628)-2462)
(SERL-64-5; AFCRL-64-341; AD-604882)

This report describes studies concerned with the determination of an optimum light arrangement for promoting algae growth, the design and construction of a unit incorporating these findings, the design and operation of specialized units to obtain effective waste treatment, and the development of an advanced model of the microterella.

Author

N64-29918 George Washington U., Washington, D.C. Human Resources Research Office

HumRRO WORK PROGRAM, FISCAL YEAR 1965: RESEARCH AND DEVELOPMENT IN TRAINING, MOTIVATION, AND LEADERSHIP

30 Jun. 1964 146 p
(Contract DA-44-188-ARO-2)
(AD-446448)

This report is divided as follows: (1) Individual Training for Equipment Operation and Maintenance; (2) Orientation and Training in Army Training Centers; (3) Small Unit Training; (4) Training for Leadership, Command, and Control; (5) Language and Area Training; (6) Training Technology; and (7) Basic Research.

A.W.

N64-29938 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio Biomedical Lab.

PATHOLOGY AND TOXICOLOGY OF REPEATED DOSES OF HYDRAZINE AND 1,1-DIMETHYLHYDRAZINE IN MONKEYS AND RATS Technical Documentary Report, Mar. 1962-Dec. 1963

Roman L. Patrick and Kenneth C. Back Jun. 1964 18 p refs
(AMRL-TDR-64-48; AD-604525) OTS: \$0.50

In the hydrazine-treated group of monkeys, serum glutamic oxaloacetic transaminase and bilirubin rose with doses of 20 mg/kg, with more than a twentyfold increase of SGOT in two animals. Most of those receiving 20 mg/kg exhibited loss of appetite, vomiting, lethargy, and severe weakness. Microscopic examination revealed lipid accumulation in the liver, myocardium, kidney, and skeletal muscle. Massive liver necrosis was observed in one animal. In those monkeys receiving UDMH, blood glucose rose significantly toward the end of the experiment. Some lipid was deposited in the heart, liver, and kidney, but to a much lesser degree than was observed with hydrazine, and it could only be demonstrated with special fat stain. Rats given from 3 to 23 doses of 10 or 20 mg/kg/day hydrazine did not show marked fatty changes as observed in the monkeys.

Author

N64-29939 Army Natick Labs., Mass.

DEVELOPMENT OF FOOD ITEMS TO MEET AIR FORCE REQUIREMENTS FOR SPACE TRAVEL

Herbert A. Hollender Wright-Patterson AFB, Ohio, Biomed. Lab., Jun. 1964 63 p
(Contract AF 33(616)-6118)
(AMRL-TDR-64-38; AD-604737) OTS: \$1.75

Prototype foods to meet the requirements of space travelers have been investigated. These foods were required to be lightweight, easy to prepare, highly nutritious, neither thirst provoking nor gas forming, and low in crude fiber. The food

should not exceed a cube size of 1/4 to 3/8 inch and should, after storage up to 6-months at 40°, 70°, and 100° F, closely resemble the color, flavor, and texture of fresh food. Freeze-dried foods were investigated. Certain tubed foods were studied to determine whether they were acceptable after storage up to 15 months at 40°, 70°, and 100° F. Many tubes showed internal swelling. Peaches, apricots, beef and vegetables, and beef and gravy in tubes with Sunex 11-S lining were found to be acceptable in both texture and taste. Studies of Chlorella 71105 were made to modify the flavor, taste, and color and to enhance the nutritive values.

Author

N64-29941 Cincinnati U., Ohio Coll. of Medicine
METABOLIC CHANGES IN HUMANS FOLLOWING TOTAL BODY IRRADIATION, 1 NOVEMBER 1961-30 APRIL 1963

Eugene L. Saenger [1963] 57 p refs
 (Contract DA-49-146-XZ-029)
 (DASA-1422; AD-604478)

This report summarizes the work carried out on 10 additional patients given acute, whole-body irradiation. The radiation doses administered to these patients ranged from 155 to 336 midline air dose (100 to 200 rad midline tissue dose). Results and conclusions from this research include the following: (1) A new technique has been developed for identification of deoxycytidine, presumably a breakdown product of DNA. Deoxycytidine has been identified in urine following whole-body irradiation. (2) Xanthurenic acid, an end product of tryptophane metabolism, has been found in the urine of some of the patients after whole-body irradiation. (3) Chromosomal abnormalities have been identified in white cells immediately after irradiation. (4) Human beings can tolerate doses of 200 rad (300 r) relatively well as far as combat effectiveness is concerned, but it is probable that a second dose of the order of 200 rad, even after apparent complete recovery, will result in a significant number of individuals becoming combat ineffective immediately.

Author

N64-29947 Army Personnel Research Office, Washington, D.C.
CERTITUDE JUDGMENTS AND ACCURACY OF INFORMATION ASSIMILATION FROM VISUAL DISPLAYS

Robert S. Andrews, Jr. and Seymour Ringel May 1964 32 p refs
 (USAPRO-TRN-145; AD-601971)

The present study was conducted to determine the extent to which certitude coincides with the accuracy of information assimilation and the extent to which the two are similarly affected by pertinent display variables. Certitude and accuracy were studied in relation to two information characteristics—amount of information presented and extent of change introduced in updating. The experimental design, conduct of the experiment, and statistical analysis are described. Viewers' certitude and the accuracy of their information assimilation corresponded most closely when the smallest amount of information was presented and the least change was made in updating. As amount of information increased, average accuracy and average certitude both decreased. However, increased change in updating reduced certitude but had negligible effect on accuracy. An 8-point scale, qualitatively labeled, provided a reliable measure of certitude.

Author

N64-29974 Farr Cytochemical Labs., Camden, Me.
RESEARCH ON THE CYTOCHEMISTRY OF CELL WALLS OF MICROORGANISMS

Wanda K. Farr Wright-Patterson AFB, Ohio, AMRL, Jun. 1964 94 p refs

(Contract AF 33(657)-10166)

(AMRL-TDR-64-52; AD-605213) OTS: \$2.25

As a part of the research program designed to solve the nutritional problems of astronauts during extended explorations of space, cell wall substances of four fungi, *Heterocephalum aurantiacum*, *Spicaria* sp., *Cladosporium* sp. and *Linderina pennispora* have been identified and localized by standard cytochemical methods. Chitin is the resistant cell wall material in the component cells of all of these fungi, and results of efforts to identify cellulose in the same cell walls have been negative. Excretions that accumulate on the surfaces of the aerial corticating hyphae of *H. aurantiacum* are composed primarily of calcium salts and an unidentified colloidal material, yellow-orange in color and having many characteristics in common with the so-called "fungal gamboge." Reactions of the previously untreated chitinous cell walls to the enzyme, chitinase, are positive. Enzymatic hydrolysis represents the most suitable method now available for the conversion of chitin to N-acetylglucosamine with the accompanying breakdown of the cell wall and concurrent release of nutritive substances in the protoplast.

Author

N64-29988 Florida U., Gainesville Coll. of Medicine
MEASUREMENT OF AIRWAY RESISTANCE WITH A VOLUME DISPLACEMENT BODY PLETHYSMOGRAPH

M. J. Jaeger and A. B. Otis Brooks AFB, Tex., SAM, Jun. 1964 17 p refs
 (Contracts AF 41(657)-102; AF 41(609)-1553)
 (SAM-TDR-64-17; AD-604464)

Airway resistance was measured with a volume displacement body plethysmograph in 40 normal subjects breathing at their spontaneous breathing rate. The measurements are based on a method designed by DuBois et al., which was modified in order to extend its applicability. The subjects were rebreathing from a bag containing gas at approximately BTPS conditions. Possible errors in conditioning the gas in the bag were corrected mathematically. The values of airway resistance obtained (1.26 ± 0.39 cm. H₂O per liter per second) agree with those published by DuBois et al. and by other authors using the same technique. The measurements were found to correlate with results obtained on the same subjects with related techniques. The paper also includes measurements of lung-tissue viscous resistance and inertance of the gas in the airways.

Author

N64-29989 Ohio State U. Research Foundation, Columbus
CATHETER-TIP FLOWMETER FOR THE MEASUREMENT OF CORONARY ARTERIAL BLOOD FLOW IN INTACT ANESTHETIZED DOGS

Heinz P. Pieper Brooks AFB, Tex., Sam, Jun. 1964 12 p refs
 (Contract AF 41(609)-1454)
 (SAM-TDR-64-33; AD-604465)

A catheter-tip flowmeter has been designed for the measurement of coronary arterial blood flow in closed-chest dogs. The miniaturized flowmeter is attached to the tip of a rigid catheter, which is inserted through the right carotid artery. The flowmeter is placed in the ascending aorta where it measures the inflow into the left coronary artery. Performance tests show the reliability of the instrument for the measurement of pulsatile flow. The flowmeter has been applied to determine the pressure-flow relationship of the coronary system of closed-chest anesthetized dogs. This pressure-flow relationship is obtained over the pressure range of greatest physiologic importance and describes the system for a constant set of cardiovascular conditions.

Author

N64-29995 Naval School of Aviation Medicine, Pensacola, Fla.

INTERDEPENDENCE AMONG SOME FACTORS ASSOCIATED WITH CORONARY HEART DISEASE

Albert Oberman, Richard E. Doll, and Ashton Graybiel 5 Mar. 1964 21 p refs
(Rept.-9; AD-601992)

Interrelations among certain factors predisposing to coronary heart disease were evaluated in a prospective study of healthy young men followed for an 18-year period. Analyses of these noncontinuous data by means of chi squares and contingency coefficients reveal significant associations. Pertinent findings are discussed in relation to present knowledge of the epidemiology of coronary heart disease. Author

N64-30018 Purdue U., Lafayette, Ind. Control and Information Systems Lab.

AN ADAPTIVE MODEL OF THE HUMAN OPERATOR IN A CONTROL SYSTEM

K. S. Fu and D. E. Knoop Sep. 1964 141 p refs
(Grants AF-AFOSR-62-351; NSF GP-2183; NSF GP-1872)
(TR-EE64-15; PRF-3810)

The input-output data are analyzed of a human operator engaged in a time-varying control situation. A mathematical model, functionally equivalent to the subject's performance, is synthesized. The type of control situation considered was that of one-dimensional, compensatory visual-manual tracking.

A.W.

N64-30036 Argentina Comision Nacional de Energia Atómica, Buenos Aires

THE SILVER HALIDES AS SEPARATION AGENTS OF THE RADIOIODIDE ION [LOS HALUROS DE PLATA COMO AGENTES SECUESTRANTES DEL ION RADIO-IODURO]

Leopoldo J. Anghileri 1964 10 p refs In SPANISH /ts Informe No. 116

Silver iodide and silver chloride have been used successfully as sequestering agents for the radioactive iodine ion. The amount of radioactive ion separated by the salt was measured by precipitating the reaction product on a gelatin substrate. The effects of ion concentration, substrate concentration, temperature, pH, and silver concentration were measured. Silver chloride was found to be about 10% more effective than silver iodide at all concentrations. D.E.R.

N64-30094 National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

SOME OBSERVATIONS DURING WEIGHTLESSNESS SIMULATION WITH SUBJECT IMMERSED IN A ROTATING WATER TANK

Ralph W. Stone, Jr. and William Letko Washington, NASA, Sep. 1964 22 p refs
(NASA-TN-D-2195) OTS: \$0.50

An investigation was made with a rotating water tank to determine the feasibility of the water-immersion technique for weightlessness simulation, including an attempted elimination of the otolith cues by rotation. Because of the early orbital flights the experiments were not continued and the technique was not fully evaluated; however, the experiences encountered are believed to be of general interest and of some possible physiological consequence. Author

N64-30148 Naval School of Aviation Medicine, Pensacola, Fla.

PERSONALITY ORIENTATION AND SUCCESS IN NAVAL AVIATION TRAINING

Richard W. Shoenberger 12 Dec. 1963 7 p refs
(Rept.-38; AD-434922)

The relationship between personality orientation, as measured by Bass' SIT Inventory, and success in naval aviation training was investigated. This was done as an evaluation of the SIT Inventory as a possible addition to the aviation selection test battery. Results showed that SIT scores bear little relationship to success in naval aviation training, and it was concluded that the addition of the SIT Inventory to the selection battery would not increase prediction validity.

Author

N64-30156 Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Div.

INTERACTION OF SIMULTANEOUS REACTION CONDITIONS OF HUMANS [VZAIMODEYSTVIYE ODNOVREMENNYKH USPOVNYKH REAKTSIY U CHELOVEKA]

N. Yu. Alekseyenko 5 Aug. 1964 41 p Transl. into ENGLISH from Izd. Akad. Nauk SSSR (Moscow), 1963 p 1-41
(FTD-TT-64-282/1+2; AD-605243)

Relationships between the movements of both hands during hemiparesis were investigated. It was found that, under conditions approaching simultaneity, the conditioned reflexes of animals (as well as of human beings) interfere with and retard each other. However after a period of training, a pair of reactions appear to lose their mutually hindering properties. Several experimental programs on these subjects are reviewed. Experiments were carried out on human beings to determine the relationships of conditioned reflexes in response to acoustic, electric, and tactile stimulation.

D.E.W.

N64-30169 Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.

A DISCUSSION OF MEDICAL MONITORING IN RELATION TO SAFETY IN CENTRIFUGE OPERATIONS Report No. 10

Stuart Ragland, Jr. 17 Jun. 1964 12 p refs

(NADC-ML-6410; AD-602779)

The importance of a continuous voice communication loop between the subject and monitor is stressed so that the monitor can make continuing judgments regarding the subject's condition based on the appropriateness of answers, occurrence of coughing, etc. Great emphasis is placed on the importance of closed circuit television as an aid in monitoring, since the appearance of the subject's face, especially his eyes, can be checked for changes during the runs. The role of the electrocardiogram in monitoring is discussed, as are some of the problems developed during acceleration runs. Some of the factors involved in proper selection of subjects for centrifuge experimentation also are presented.

Author

N64-30195 Miami U., Coral Gables, Fla. Marine Lab. **A SUMMARY OF EXISTING INFORMATION ON THE FRESH-WATER BRACKISH-WATER AND MARINE ECOLOGY OF THE FLORIDA EVERGLADES REGION IN RELATION TO FRESH WATER NEEDS OF EVERGLADES NATIONAL PARK**

Durbin C. Tabb Dec. 1963 156 p refs

(ML-63609)

Existing information on the fresh-water, brackish-water, and marine ecology of the Florida Everglades region is summarized in relation to fresh-water needs of the Everglades National Park. There have been pronounced changes in the water level, water supply, and water dispersal in the area in

and around the Park, and these changes are still going on. The major changes in the watershed, exclusive of the completion of Conservation Area 3, took place prior to the final establishment of the Park boundaries in 1947; the Park biota had probably adjusted to these major changes by that time. If it is desirable to restore the park water budget to the pre-drainage conditions, thorough studies of the ecological requirements of the flora and fauna will first be required, as well as research on the conditions of runoff that are required to maintain these elements in the virgin state. As long as the region is a national park, the Park Service Administration should resist any manmade water control structures within the Park boundaries.

I.v.L.

N64-30199 Instrument Pilot Instructor School, Randolph AFB, Tex.

CONTROL-DISPLAY PILOT FACTORS PROGRAM

Dec. 1963 111 p refs
(AD-441953)

Intervening levels of control between full manual and full automatic were examined for the purpose of determining the compatibility of the human pilot with an automatic flight-control system using force wheel steering as the link between the two elements. Two identically equipped T-39 aircraft were utilized in the inflight examination. Twenty-six pilots representing commercial airlines, FAA, and the USAF flew every possible combination of the two levels of control in pitch, and three levels of control in roll, a total of five times; two times were for training and three times for record. A reduction in pilot workload, unburdening, was obtained as a function of increasing levels of automation.

Author

IAA ENTRIES

A64-24098

CONSIDERATIONS ON SOME RESPIRATORY PARAMETERS RECORDED IN OVER 1000 PILOT CANDIDATES [CONSIDERAZIONI SU ALCUNE GRANDEZZE RESPIRATORIE RILEVATE IN OLTRE 1000 ASPIRANTI AL PILOTAGGIO AEREO].

F. Rossanigo and G. Janigro (Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy).

Rivista di Medicina Aeronautica e Spaziale, vol. 27, Apr.-June 1964, p. 155-175. 11 refs. In Italian.

Evaluation of the data on vital capacity, namely maximum respiratory volume per second and Tiffeneau's index, which was measured in a group of 1048 applicants, ranging in age from 18 to 22, who were found to be healthy in specialized clinical studies. It is stated that the comparison of the above data with the theoretical values furnished by the suggested nomograms and formulas shows that the experimental data differ variously from the theoretical values. This is said to be due to the various case histories investigated. It is suggested that flying applicants be screened by means of tables and a nomogram formed by a statistical development of the experimental data.

A64-24099

ON THE USE OF ADENOSINETRIPHOSPHORIC ACID AND CO-CARBOXYLASE IN THE TREATMENT OF PILOTS AFFLICTED WITH MILD OR INITIAL FLYING FATIGUE [SULL' IMPIEGO DELL' ACIDO ADENOSINTRIFOSFORICO E DELLA COCARBOSSLASI IN PILOTI AFFETTI DA LIEVE O INIZIALE FATICA DI VOLO].

G. Rotondo (Padova, Università, Istituto di Medicina Legale e delle Assicurazioni, Padua; Prima Regione Aerea, Direzione di Sanità, Milan, Italy).

Rivista di Medicina Aeronautica e Spaziale, vol. 27, Apr.-June 1964, p. 176-192. 19 refs. In Italian.

Investigation of the effectiveness of the combined treatment of flying fatigue by means of cocarboxylase and adenosinetriphosphoric acid, administered orally to 20 jet pilots, with mild or initial forms of this syndrome. It is stated that the results, consisting in the appreciable improvement in the symptoms and operational efficiency, in nearly all subjects, point to the necessity for further and wider testing. This treatment could be useful, from a medico-legal standpoint, in preventing flying accidents and prolonged disability, by bringing about the prompt recovery of the stricken personnel. It is suggested that the prompt and complete treatment of these mild and initial forms is necessary to avoid more severe and less recoverable forms. A survey is provided of the physiological and pharmacological mechanisms of the above-mentioned drugs in the satisfactory treatment of operational fatigue, particularly on the basis of modern etiopathogenetic views on this syndrome.

A64-24100

ON THE RELATIONSHIPS BETWEEN ANOXIA AND BONE MARROW GRAFT IN WHOLLY IRRADIATED MICE [SUI RAPPORTI ESISTENTI TRA L'ANOSSIA E IL TRAPIANTO DI MIDOLLO OSSEO IN TOPI PANIRRADIATI].

G. Mazzella (Ispettorato di Sanità Aeronautica, Rome; Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). (Settimana Medica degli Ospedali, Comunicazione, Apr. 1964.)

Rivista di Medicina Aeronautica e Spaziale, vol. 27, Apr.-June 1964, p. 193-197. In Italian.

Brief survey of the results obtained over several years of investigations of the effects of anoxic anoxia on the taking of bone marrow grafts in mice, previously wholly irradiated with ionizing radiations of various sources. The causes of the protective mechanisms, as well as the advantages obtained from the tests, are discussed.

A64-24126

THE HUMAN OPERATOR AS A MONITOR AND CONTROLLER OF MULTIDEGREE OF FREEDOM SYSTEMS.

John W. Senders (Bolt Beranek and Newman, Inc., Cambridge, Mass.).

(National Symposium on Human Factors in Electronics, Washington, D.C., May 2, 1963.)

IEEE Transactions on Human Factors in Electronics, vol. HFE-5, Sept. 1964, p. 2-5. 19 refs.

Analysis of the sampling process exhibited by a human operator. A model is presented that attempts to predict the relation between the kind and rate of information displayed on any display and the frequency and duration of samples made of that display. The approach utilizes the notion that it is possible to quantify the attentional demand or work load placed on the monitor or controller by each source of information in a complex man-machine system. The attentional demand is calculated on the basis of the bandwidth and required precision of readout of the signal presented by an information source. It is measured by the frequency and duration of fixations on an information source. The results of theoretical calculations compare favorably with experimental results.

A64-24127

ADAPTIVE DYNAMIC RESPONSE CHARACTERISTICS OF THE HUMAN OPERATOR IN SIMPLE MANUAL CONTROL.

L. R. Young (Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics, Cambridge, Mass.), D. M. Green (Pennsylvania University, Dept. of Psychology, Philadelphia, Pa.); Bolt Beranek and Newman, Inc., Cambridge, Mass.), J. I. Elkind, and J. A. Kelly (Bolt Beranek and Newman, Inc., Cambridge, Mass.).

IEEE Transactions on Human Factors in Electronics, vol. HFE-5, Sept. 1964, p. 6-13. 5 refs.

Contracts No. NASw-185; No. NASw-668.

Experimental investigation of human adaptive control following sudden changes in gain or polarity of the controlled element in a closed-loop tracking task. The experiments use primarily simple position control to determine lower bounds on the adaptation process. Random inputs are tracked under pursuit and compensatory single-axis displays. Average error waveforms following controlled element transitions reveal the time course of adaptation. The average waveforms and data on time necessary to cancel the errors following transitions indicate some of the factors affecting the adaptation process. The times necessary for adaptation to changes in simple tracking systems are found to be quite small. Human operator control adaptation generally occurs in 0.4-0.8 sec following a controlled element change, and the resulting error is usually reduced to its asymptotic level in 1-3 sec following transition.

A64-24128

OPERATOR DECISION PERFORMANCE USING PROBABILISTIC DISPLAYS OF OBJECT LOCATION.

Louis M. Herman, George N. Ornstein (North American Aviation, Inc., Columbus Div., Columbus, Ohio), and Harry P. Bahrick (Ohio Wesleyan University, Delaware, Ohio).

(International Congress on Human Factors in Electronics, Long Beach, Calif., May 3, 1962.)

IEEE Transactions on Human Factors in Electronics, vol. HFE-5, Sept. 1964, p. 13-19. 8 refs.

Comparison of the relative effectiveness of a conventional display of object location with the effectiveness of various probabilistic displays of object location. Several display possibilities for presenting probabilistic information to a system operator are discussed, and an experiment is performed to the potential usefulness of selected probabilistic display types in improving operator performance. Performance evaluation metrics include the degree of accuracy achieved by the operator in estimating probabilities of events and the expected value of his decisions within a simulated search-attack mission. The effectiveness of operators using a nonprobabilistic (conventional) display also is tested by these same metrics. In general, probabilistic information processing appears to offer an improved alternative to nonprobabilistic information processing. With premission training and definitively presented probability information, probabilistic displays can be interpreted accurately by the operator and employed effectively by him within a system.

A64-24129

IMPROVEMENT OF THE HUMAN OPERATOR'S TRACKING PERFORMANCE BY MEANS OF OPTIMUM FILTERING AND PREDICTION.

Walter W. Wierwille (Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y.).

IEEE Transactions on Human Factors in Electronics, vol. HFE-5, Sept. 1964, p. 20-24. 9 refs.

Application of the theory of optimum filtering and prediction to man-machine tracking control systems to improve performance in tracking waveforms possessing a somewhat random appearance. The predicted values of the input for a set of prediction times are displayed in perspective for interpretation by the human operator. This display is evaluated in an experimental tracking task.

A64-24130

A NONLINEAR STUDY OF COMPENSATORY MANUAL CONTROL SYSTEMS.

Donald L. Snyder (Massachusetts Institute of Technology, Dept. of Electrical Engineering, Cambridge, Mass.).

IEEE Transactions on Human Factors in Electronics, vol. HFE-5, Sept. 1964, p. 25-28. 12 refs.

Research sponsored by Massachusetts Institute of Technology; Contract No. AF 19(628)-242; Grant No. NSG-107-61.

Results of a preliminary examination of the nonlinear characteristics of a closed-loop manual control system operated in the compensatory tracking mode. Particular consideration is given to nonlinearities of the closed-loop system resulting from inherent nonlinearities within the human operator and the adaptive capabilities of the human operator in compensating for nonlinearities arising in the controlled process. The results indicate that low-order nonlinearities do not account for a substantial portion of the remnant and that a human operator is able to partially compensate for simple nonlinear controlled processes.

A64-24163

EFFECTS OF DECELERATION ON RATS EXPOSED TO PROLONGE CENTRIFUGATION.

J. Oyama and W. T. Platt (NASA, Ames Research Center, Moffett Field, Calif.).

Nature, vol. 203, Aug. 15, 1964, p. 766, 767.

Experimental investigation of the effects of both an increase and decrease in gravity on rats adapted to relatively high g by prolonged centrifugation. It is stated that a characteristic rapid increase in body-weight of rats removed from the centrifuge is noted with the greatest rate of increase occurring during the first 24 hr. There was a progressive rise in the magnitude of this increase with each successive exposure treatment. This increase is attributed to an enhanced rate of food and water consumption. It is noted that the results obtained indicate that deceleration is well tolerated by rats and appears not to be a stress factor. On the other hand, any sustained incremental increase in gravity has a deleterious effect on appetite and body-weight maintenance, and can be considered a condition of imposed stress.

A64-24167

PROPERTIES, MEASUREMENT, AND BIOCLIMATIC ACTION OF "SMALL" MULTIMOLECULAR ATMOSPHERIC IONS.

M. Knoll, J. Eichmeier, and R. W. Schön (München, Technische Hochschule, Institut für Technische Elektronik, Munich, West Germany).

IN: ADVANCES IN ELECTRONICS AND ELECTRON PHYSICS. VOLUME 19.

Edited by L. Marton.

New York and London, Academic Press, 1964, p. 177-254.

377 refs.

Detailed review of investigations concerning the physical and biological effects of natural and artificially produced small air ions, which are defined as those having mobilities smaller than 2. The formation and aging processes of small air ions are described, as are methods and devices for measuring their concentration and physical properties, such as the ion current probe, ion counters, and mobility spectrometers. Results are presented from investigations on ion concentration and mobility. Results from biological experiments considered include the effect of small ions on simple visual reaction time of man, on the respiratory tract, pulse rate, blood pressure, electroencephalogram, bacteria and cells, and on

the growth of plants. Also considered briefly are therapeutic actions of atmospheric ions and working hypotheses of air ion action on organisms.

A64-24259

STUDY OF THE PHYSIOLOGICAL REACTIONS OF THE CAT DURING A ROCKET FLIGHT [ETUDE DES REACTIONS PHYSIOLOGIQUES DU CHAT LORS D'UN VOL EN FUSEE].

G. Chatelier and J. Ginet (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France). Revue Française d'Astronautique, May-June 1964, p. 96-108. In French.

Report of tests on two conscious cats during the latest French biological experiments with rockets. The animals carried electrodes designed to pick up different physiological parameters which, after transmission by telemetry, were recorded on the Earth during the flight. These recordings were based on the spontaneous electric activity of the somesthetic and associative areas and of the deeper regions such as the hippocampus and the reticulate formation. Readings of the potentials induced on the cortical somesthetic area were obtained by electrical stimulation of the paw. The respiratory and cardiac rhythms were also recorded. These physiological activities were analyzed in terms of the different physical factors experienced by the animals during the flight.

A64-24310

DEVELOPMENTS IN ENGINE INSTRUMENT DISPLAYS.

R. A. Chorley (Smith Aviation Division, Wembley, Middx., England).

Aeroplane and Commercial Aviation News, vol. 108, July 16, 1964, p. 20, 21.

Discussion of various types of displays with reference to ease of reading, accuracy of information, complexity, and space required. A vertical "thermometer"-type display is described which is easy to read but is considered unsatisfactory because each indicator must be servodriven, the degree of accuracy is insufficient, and it is difficult to assess quickly the performance of an individual engine. A more convenient arrangement can be made by combining digital displays with horizontal tapes, but it is still difficult to assess the performance of one engine. A recent proposal for a set of engine instruments for a four-engine aircraft describes a series of quadruple dial-and-pointer indicators of the same spatial layout as the conventional panel, but more compact, and which gives accurate direct readout and incorporates warning lights. It is considered that this arrangement is optimal.

A64-24392

BIOASTRONAUTICS.

Edited by Karl E. Schaefer (U.S. Naval Medical Research Laboratory, Groton, Conn.).

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964. 406 p.

\$16.

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FOREWORD. Orr T. Reynolds, p. iii-v.

PREFACE. Karl E. Schaefer (U.S. Navy, Groton, Conn.), p. vii, viii.

PART I - PHYSIOLOGICAL PROBLEMS IN SPACE FLIGHT.

ACCELERATION STRESS. J. P. Meehan (Southern California University, Los Angeles, Calif.), p. 3-26. 56 refs. [See A64-24393 20-16]

TRANSIENT ACCELERATION, VIBRATION AND NOISE PROBLEMS IN SPACE FLIGHT. Henning E. von Gierke (USAF, Wright-Patterson AFB, Ohio), p. 27-75. 144 refs. [See A64-24394 20-16]

GASEOUS REQUIREMENTS IN MANNED SPACE FLIGHT. Karl E. Schaefer (U.S. Navy, Groton, Conn.), p. 76-110. 124 refs. [See A64-24395 20-16]

THERMAL BALANCE, HEAT TOLERANCE, AND PROTECTION. Paul Webb (Webb Associates, Yellow Springs, Ohio), p. 111-128. 39 refs. [See A64-24396 20-16]

DOSIMETRY OF RADIATION FIELDS IN SPACE. Hermann J. Schaefer (U.S. Navy, Pensacola, Fla.), p. 129-172. 49 refs. [See A64-24397 20-16]

BIOLOGICAL EFFECTS OF MAGNETIC FIELDS IN THEIR RELATION TO SPACE TRAVEL. Dietrich E. Beischer (U.S. Navy, Pensacola, Fla.), p. 173-180. 29 refs. [See A64-24398 20-16]

PHYSIOLOGICAL RHYTHMS AND BIOASTRONAUTICS. Franz Halberg (Minnesota, University, Minneapolis, Minn.), p. 181-195. 35 refs. [See A64-24399 20-16]

PSYCHOPHYSIOLOGICAL PROBLEMS IN SPACE FLIGHT. George Hauty (Federal Aviation Agency, Oklahoma City, Okla.), p. 196-224. 27 refs. [See A64-24400 20-14]

PART II - TECHNOLOGICAL ASPECTS (MAN-MACHINE SYSTEMS).

BIOENGINEERING AND BIOINSTRUMENTATION. Alfred M. Mayo (Ling-Temco-Vought, Inc., Dallas, Tex.) and James Parker Nolan, Jr. (NASA, Washington, D.C.), p. 227-273. 86 refs. [See A64-24401 20-14]

SPACE ECOLOGICAL SYSTEMS. Eugene B. Konecci (NASA, Washington, D.C.), p. 274-304. 25 refs. [See A64-24402 20-16]

PART III - SPACE FLIGHT OPERATIONS.

MEDICAL ASPECTS OF ASTRONAUT TRAINING. William K. Douglas (USAF, Patrick AFB, Fla.), p. 307-313. [See A64-24403 20-14]

PHYSIOLOGICAL EFFECTS OF SPACE FLIGHT IN ANIMALS AND MEN. James P. Henry (USAF; Southern California, University Los Angeles, Calif.), p. 314-329. 28 refs. [See A64-24404 20-16]

PART IV - PERSPECTIVES.

BIOLOGICAL COMPUTERS. W. Ross Ashby and Heinz von Foerster (Illinois, University, Urbana, Ill.), p. 333-360. 26 refs. [See A64-24405 20-14]

EXPERIENCED SPACE AND TIME. Hermann von Schelling (General Electric Co., Schenectady, N.Y.), p. 361-385. 8 refs. [See A64-24406 20-14]

EXPERIMENTS CONCERNING THE NON-EUCLIDEAN STRUCTURE OF THE VISUAL SPACE. Gerhard Kienle (Tübingen, Universität, Tübingen, West Germany), p. 386-400. 19 refs. [See A64-24407 20-14]

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A64-24393

ACCELERATION STRESS.

J. P. Meehan (Southern California, University, Los Angeles, Calif.).

IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 3-26. 56 refs.

Description of an investigation of the effects of complex acceleration environments on man. This paper begins with a brief history of acceleration studies and a statement that centrifuges are currently being designed to combine, insofar as possible, the capabilities of rocket-powered sleds, drop towers, and vibrating devices. The remainder of the paper contains sections on current terminology, a review of the subjective endpoints in acceleration experiments, long-duration acceleration, slow rotation, rapidly applied accelerations, and vibration. In each of the sections, specific acceleration variables and effects are discussed with respect to human organ systems.

A64-24394

TRANSIENT ACCELERATION, VIBRATION AND NOISE PROBLEMS IN SPACE FLIGHT.

Henning E. von Gierke (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

(Progress in the Astronautical Sciences. Vol. I. Amsterdam, North-Holland Publishing Co., 1962, p. 343-401.)

IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 27-75. 144 refs.

[For abstract see Accession no. A63-17236 14-16]

A64-24395

GASEOUS REQUIREMENTS IN MANNED SPACE FLIGHT.

Karl E. Schaefer (Naval Medical Research Laboratory, Physiology Branch, Groton, Conn.).

IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 76-110. 124 refs.

Discussion of (1) the limits of various components of the atmosphere to which man in space can be expected to adapt, (2) the hazards of space flight that are posed by the composition of the space capsule atmosphere and toxic trace contaminants, and (3) artificial means to raise resistance to environmental stressors. Articles by Simons and Archibald and by Schaefer on the selection of a space cabin atmosphere are updated by information that has recently become available. The adaptation ranges to gaseous components are said to be less clearly defined than are the acute tolerance limits for most other environmental factors in the spacecraft, and there is considered to be a lack of knowledge about the interaction of various environmental stressors. Experience in nuclear-powered submarines is said to indicate that maximum allowable concentrations (MAC) for toxic trace substances as found in industry are not applicable. New MAC values, already proposed for continuous 90-day exposure in nuclear submarines, are presently being established for spacecraft. An urgent need is said to exist for studies on the synergistic effects of trace substances.

A64-24396

THERMAL BALANCE, HEAT TOLERANCE, AND PROTECTION.

Paul Webb (Webb Associates, Yellow Springs, Ohio).

IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 111-128. 39 refs.

Consideration of man as a heat-producing biological entity who regulates his temperature within narrow limits. The author considers ways in which thermal balance is maintained in the artificial environment provided in space. Discussion includes: man in an isolated radiation environment; the special importance of humidity control in sealed cabins; the need for precise figures for metabolic heat production for long periods under subgravity conditions; the thermal problems of pressure suits; and human tolerance to the extreme thermal transients (slow heat pulses) encountered during the aerodynamic heating period of re-entry. In addition to standard scientific periodicals, engineering proposals are said to have been a valuable source of material for this paper.

A64-24397

DOSIMETRY OF RADIATION FIELDS IN SPACE.

Hermann J. Schaefer (U.S. Navy, School of Aviation Medicine, Biophysics Dept., Pensacola, Fla.).

IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 129-172. 49 refs.

Discussion of differences which are found to distinguish radiation exposure in flare-produced and Van Allen belt proton beams from exposure to beams from laboratory sources. These differences are said to impede the radiobiologist's determination of the true radiation burden and the radiation safety engineer's efforts to design shielding. It is indicated that during times of a quiet Sun, additional shielding is definitely not required, even for a deep-space venture extending over 10 or 20 days. The degree of protection desired against the eventuality of a larger solar flare is said to depend on highly subjective determinants such as the risk factor that would be considered acceptable or the dose levels that would be considered allowable. The effects of shielding on the penetrating power of the residual beam are discussed, and it is thought that the general relationships presented should provide sufficient information to make rough estimates of weight penalties involved in a particular design. It is said to appear to be a logical conclusion that for total body exposure with a steep drop of the depth dose, the actual net injury should be substantially smaller than for exposures with only slightly lowered midpoint doses. Additional animal studies on a greater variation of the depth dose pattern would be of considerable interest, it is thought.

A64-24398

BIOLOGICAL EFFECTS OF MAGNETIC FIELDS IN THEIR RELATION TO SPACE TRAVEL.
 Dietrich E. Beischer (U.S. Navy, School of Aviation Medicine, Pensacola, Fla.).
 IN: BIOASTRONAUTICS.
 Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 173-180. 29 refs.

Report citing the need for more information on biomagnetic effects. Five major topics are discussed: (1) the extraterrestrial magnetic environment, (2) historical remarks and literature on biomagnetics, (3) effects of magnetic fields on man, (4) effects of magnetic fields on animals, and (5) physical forces behind the biomagnetic effects. Bioeffects of inhomogeneous magnetic fields are thought to be due to a separation that occurs between paramagnetic substances and diamagnetic substances; bioeffects of homogeneous fields, however, are said to be more difficult to explain. It is stated that magnetic forces play no easily recognizable role in the survival of life on the surface of the Earth. Indications are, however, that just as space travel has introduced new extremes of gravitational forces (high-impact forces and the gravity-free state), similar extremes of magnetic forces must be considered in extra-terrestrial habitation.

A64-24399

PHYSIOLOGICAL RHYTHMS AND BIOASTRONAUTICS.
 Franz Halberg (Minnesota, University, Medical School, Dept. of Pathology, Minneapolis, Minn.).
 IN: BIOASTRONAUTICS.
 Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 181-195. 35 refs.
 Research supported by U.S. Public Health Service, American Cancer Society, Elsa U. Pardee Foundation, Dept. of Welfare, and State of Minnesota; Grant No. NSG 517.

Discussion of biological cycles that have frequencies of approximately 24 hours. In order to answer the question of whether characteristic rhythms will be altered in extraterrestrial space, it is thought necessary that certain characteristics of rhythms in a terrestrial environment be reliably defined under specified conditions and that the conditions during study of rhythms in extraterrestrial space be defined insofar as is possible. Topics dealt with are: physiological rhythms in man; interactions among rhythms; variance spectra of physiological rhythms; circadian systems; external and internal timing of circadian systems; limits to temporal adaptation; mechanisms of circadian organization, and circadian desynchronization. A number of graphs and tables are presented and some unsolved problems are mentioned.

A64-24400

PSYCHOPHYSIOLOGICAL PROBLEMS IN SPACE FLIGHT.
 George Hauty (Federal Aviation Agency, Aeromedical Service, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
 IN: BIOASTRONAUTICS.
 Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 196-224. 27 refs.

Review and discussion of the problems of weightlessness, vigilance, and sensory deprivation. Prolonged simulated weightlessness was studied by immersing a subject (clad in a rubber suit) in a tank of water up to his neck for 7 days, removing him for only brief periods once each day. During immersion, operator performance exhibited a slight progressive decline which the author attributes to a decline in motivation. Little physiological impairment was noted although the nature and duration of the sleep states were said to have changed markedly. In the studies of vigilance and sensory deprivation, subjects were assigned the problem of flying a simulated space mission. The investigation of vigilance required the subject(s) to perform without interruption a complex series of tasks over a 30-hr period. Objective and subjective reactions to changes in the work load were monitored. In both the vigilance and the sensory-deprivation experiments the comments of the test subjects were recorded.

A64-24401

BIOENGINEERING AND BIOINSTRUMENTATION.
 Alfred M. Mayo (Ling-Temco-Vought, Inc., Chance Vought Corp., Dallas, Tex.) and James Parker Nolan, Jr. (NASA, Office of Manned Space Flight, Washington, D.C.).
 IN: BIOASTRONAUTICS.

Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 227-273. 86 refs.

Discussion of the man-machine system in the context of space vehicle operation. Among the topics discussed are: man-machine integration; integrated control; control station and system (including information and control requirements, sensors, computers, displays, controls, overall designs); cabin arrangement; atmosphere control system; weightlessness and acceleration; biological research and biosatellites; and (under the heading of bio-instrumentation) EKG; EEG; and temperature and blood-pressure measurements. To insure rapid progress in the field of bio-astronautics, the life science areas must, according to the authors, receive emphasis commensurate with the development of integrated man-machine systems. The authors call for a vigorous joint effort of life and physical scientists working closely with engineers and operations specialists.

A64-24402

SPACE ECOLOGICAL SYSTEMS.
 Eugene B. Konecni (NASA, Biotechnology and Human Research, Washington, D.C.).
 IN: BIOASTRONAUTICS.
 Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 274-304. 25 refs.

Discussion of several of the many possible closed-environment life support systems. Of the thousands of possible combinations of ecological subsystems, a few will have to be selected and rated to see if they satisfy particular mission requirements. The propulsion and auxiliary power systems are thought to be the key not only to the space flight, but also to the types of ecological systems that will be required. The propulsion systems (and therefore the ecological systems) can be divided into three general categories: orbital systems, lunar systems, and interplanetary systems. The possibility of sustaining a semipermanent base on the Moon or Mars by using naturally existing materials is considered. It is thought that life support systems can be designed and developed to provide a near-ideal terrestrial environment for travel in space not only for test pilot astronauts, but also for scientists and eventually civilian passengers.

A64-24403

MEDICAL ASPECTS OF ASTRONAUT TRAINING.
 William K. Douglas (USAF, Missile Test Center, Patrick AFB, Fla.).
 IN: BIOASTRONAUTICS.
 Edited by Karl E. Schaefer.
 New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 307-313.

Discussion of (1) basic sciences, (2) physical fitness, and (3) conditioning for space flight. It is indicated that the stresses to which the pilot of a spacecraft is exposed are generally similar to more intense than those to which an aircraft pilot is exposed. In order to safeguard the spacecraft pilot from a hostile environment which contains noise, vibration, acceleration, high temperatures, and other stresses, it is thought to be important that he be made intimately aware of the physiology of cardiovascular, respiratory, and vestibular systems. In order to increase the self-reliance of crewmen in the event of illness or incapacity, it may be advisable, according to the author, to give them instruction in diagnostic and therapeutic techniques. The subjects of dietetics and rest, immunizations, basic hygiene, and exercise are discussed, and it is suggested that experience with the use of the Self-Contained Underwater Breathing Apparatus (SCUBA) can help build stamina, give experience in voluntary respiratory control, and, to a degree, simulate weightlessness. Training devices such as the Multi-Axis Spin Test Inertia Facility (MASTIF) and the centrifuge are discussed and the role of the flight surgeon is outlined.

A64-24404

PHYSIOLOGICAL EFFECTS OF SPACE FLIGHT IN ANIMALS AND MEN.

James P. Henry (USAF, Aerospace Medical Div.; Southern California, University, Dept. of Physiology, Los Angeles, Calif.). IN: **BIOASTRONAUTICS**.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 314-329. 28 refs.

Discussion of possible physiological consequences of space flight, including labyrinthine disturbances, digestive upset, sensory deprivation, sleep and diurnal rhythm changes, circulatory impairment, and muscle and bone atrophy. These disturbances, cited in the order of their expected development, range from a rapid onset in minutes or hours for labyrinthine symptoms such as nausea and vertigo, to a matter of weeks to months for evidence of muscle and bone atrophy. It is indicated that one woman, nine men, at least six dogs, and a chimpanzee have experienced space flight for periods ranging from 1-1/2 hr to 5 days and that instrumentation has included measures of body temperature, the electroencephalogram, electrocardiogram, respiration rate, blood pressure, and performance (including the accuracy of the accomplishment of assigned tasks and the performance of bodily functions such as eating, drinking, micturition, and sleeping). No physiological disturbances directly attributable to space flight are said to have so far been recorded. It remains to be seen, according to the author, whether symptoms will develop as the duration of flights is extended from days to weeks.

A64-24405

BIOLOGICAL COMPUTERS.

W. Ross Ashby and Heinz von Foerster (Illinois, University, Dept. of Electrical Engineering, Urbana, Ill.).

IN: **BIOASTRONAUTICS**.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 333-360. 26 refs.

Grants No. NSF 17414; No. AF AFOSR 7-63.

Discussion of certain aspects of cybernetics and information theory. Beginning with a description of the neuron as a logical operator - the affirmation representing excitation and the negation representing inhibition - the authors indicate that neuron elements may be combined into networks and that these networks may be further organized into systems complex enough to perform computations and make decisions. Some of the essential features of computational principles in living organisms are outlined in a discussion which covers not only parallel networks with unalterable internal structure, but also dynamically adaptive systems. It is indicated that "computation" today means the carrying out of any well-defined process and is not limited to only mathematical processes. The authors anticipate the continuation of the evolutionary process that has led from mechanical computers to electronic computers. Rapid progress in subminiaturization and in molecular electronics will soon lead, they believe, to manmade biological computers.

A64-24406

EXPERIENCED SPACE AND TIME.

Hermann von Schelling (General Electric Co., Advanced Technology Laboratories, Schenectady, N.Y.). IN: **BIOASTRONAUTICS**.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 361-385. 8 refs.

Report of a perceptual theory of relativity. A theory of space perception, ascribed to Luneburg and which the author has attempted to make consistent, is said to predict how a fixed configuration of objects in three-dimensional space is perceived. The prediction of how motion is perceived is said to require that time be included in the finite invariant on which the theory is based. This requirement is met in the sections of the paper entitled "Basic Formulae in Minkowski's Coordinates" and "Translation of the Formulae into Real Time" in what is said to be complete analogy to the more restricted former results. The author states that he has proved in this paper that there is a double cone in the perceptual world corresponding to one which exists in the physical world, according to Weyl and Minkowski, and embraces the active future

and the passive past. It is possible, according to the author, to integrate the differential equations of the geodetic lines in a perceptual theory of relativity, and doing so is thought to prove for the assumed perceptual world that physiological age does not change on space trips. Einstein's clock paradox is discussed at some length, and the author indicates that the particular linear element belongs to a matter-free gravitational field according to Einstein's theory.

A64-24407

EXPERIMENT 15 CONCERNING THE NON-EUCLIDEAN STRUCTURE OF THE VISUAL SPACE.

Gerhard Kienle (Tübingen, Universität, Universitäts Nerven Klinik, Tübingen, West Germany).

IN: **BIOASTRONAUTICS**.

Edited by Karl E. Schaefer.

New York, Macmillan Co.; London, Collier-Macmillan, Ltd., 1964, p. 386-400. 19 refs.

Report of a test which is said to indicate that Luneburg's hypothesis on a coincidence of the curves of equal distance with the Vieth-Mueller circles is not correct. It is indicated that an apparently concentric family of circles corresponds to a hyperbolic class of circles in the physical space. The confirmation of the hyperbolic axiom on parallelism, according to the author, does not imply necessarily that the visual space is a hyperbolic space of a constant negative curvature in the sense of Lobachevsky. It is said that such difficult problems as the non-Euclidian structure of the visual space can be treated with easily visualized geometrical methods available in projective geometry and that it is not necessary to take recourse in complicated theories utilizing transformation of coordinates and nearly unlimited assumptions. Poincaré's model of hyperbolic space, applied for the first time for a mapping of the visual space, is said to show a reasonably good agreement with experimental results.

A64-24612

PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, School of Medicine, Dept. of Physiology, New Haven, Conn.).

Springfield, Ill., Charles C. Thomas, Publisher, 1964. 333 p. \$12.50.

CONTENTS:

FOREWORD. James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, New Haven, Conn.), p. vii.

TEMPERATURE PROBLEMS IN SPACE TRAVEL. James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, New Haven, Conn.), p. 3-46. 7 refs. [See A64-24613 20-16]

HIGH ENERGY RADIATIONS. Carl Clark (Martin Marietta Corp., Baltimore, Md.), p. 47-99. 55 refs. [See A64-24614 20-28]

THE GASEOUS REQUIREMENTS (RESPIRATION). Edwin Handler (U.S. Navy, Philadelphia, Pa.), p. 100-133. 50 refs. [See A64-24615 20-16]

FOOD REQUIREMENTS IN SPACE. John R. Brobeck (Pennsylvania, University, Philadelphia, Pa.), p. 134-151. 30 refs. [See A64-24616 20-16]

ACCELERATION. James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, New Haven, Conn.), p. 152-195. 8 refs. [See A64-24617 20-16]

WEIGHTLESSNESS AND SUB-GRAVITY PROBLEMS. James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, New Haven, Conn.), p. 196-208. 7 refs. [See A64-24618 20-16]

SENSORY AND PERCEPTUAL PROBLEMS IN SPACE FLIGHT. John Lott Brown (Pennsylvania, University, Philadelphia, Pa.), p. 209-230. 51 refs. [See A64-24619 20-16]

ISOLATION AND DISORIENTATION. Randall M. Chambers (U.S. Navy, Johnsville, Pa.), p. 231-297. 124 refs. [See A64-24620 20-16]

PHYSIOLOGIC RHYTHMS. Franz Halberg (Minnesota, University, Minneapolis, Minn.), p. 299-322. 27 refs. [See A64-24621 20-16]

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A64-24613

TEMPERATURE PROBLEMS IN SPACE TRAVEL.

James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, School of Medicine, Dept. of Physiology, New Haven, Conn.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 3-46.

7 refs.

Consideration of the thermal environment of interest to the astronaut and description of the physiological limitations of man and his temperature-regulatory capacities. The subjects discussed include thermal environment in space, heat transfer, radiation of heat, heat transfer by conduction, heat transfer by convection, forced convection, and evaporation. The likelihood is indicated that, with care, thermal loads in space near the Earth and Moon will be manageable by control of radiation exchanges. Heat acclimatization and training of the astronaut in a space chamber with the thermal characteristics of the space environment are said to appear warranted.

A64-24615

THE GASEOUS REQUIREMENTS (RESPIRATION).

Edwin Handler (U.S. Navy, Air Engineering Center, Aerospace Crew Equipment Laboratory, Life Sciences Research Group, Philadelphia, Pa.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 100-133. 50 refs.

Consideration of the requirements of gaseous constituents for man's breathing in space travel. It is stated that the integrity of man's physiological state during all phases of space flight depends directly upon the adequacy of his gaseous environment. The physiological effects of excesses and deficiencies in the environmental constituents of oxygen, carbon dioxide, nitrogen, toxic substances, and air ions are discussed. The effects of total pressure levels and changes in pressure are related to structural and functional changes in body organs and systems. It is noted that consideration of these factors is important in determining the gaseous environment of man in space.

A64-24616

FOOD REQUIREMENTS IN SPACE.

John R. Brobeck (Pennsylvania, University, School of Medicine, Dept. of Physiology, Philadelphia, Pa.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 134-151. 30 refs.

Discussion of the nutritional challenge constituted by the necessity of providing food for men on space missions. The importance of the following three subjects is reviewed: (1) biochemical nutritional needs, (2) feeding behavior, and (3) influence of food intake upon behavior. For each of these three, an attempt is made to decide whether data to answer critical questions are already at hand, or whether they must be discovered through research before a space mission is undertaken. It is stated that, in certain instances where the data are not known and cannot be obtained in the time available, the flights will have to be planned in a manner which does not depend upon them. With reference to food acceptability and related phenomena, almost nothing is known theoretically, but it may be possible to minimize this ignorance by utilizing a few common-sense principles. Regarding the impact of food upon behavior, neither theoretical nor practical research has been undertaken.

A64-24617

ACCELERATION.

James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, School of Medicine, Dept. of Physiology, New Haven, Conn.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 152-195. 8 refs.

Consideration of the problems associated with in-flight acceleration. The subjects considered include applied and inertial forces, the significance of g , human tolerance to accelerations, vibration and oscillation, impact, and sustained acceleration. It is noted that it is likely that a wide variety of simulators will be required for setting up as nearly as possible space conditions on the Earth and for testing the abilities of man and his machine in the space environment.

A64-24618

WEIGHTLESSNESS AND SUB-GRAVITY PROBLEMS.

James D. Hardy (John B. Pierce Foundation Laboratory, New York, N.Y.; Yale University, School of Medicine, Dept. of Physiology, New Haven, Conn.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 196-208. 7 refs.

Consideration of the general problems and consequences of weightlessness and subgravity. It is stated that there appear to be few instances in which physiologic function is truly gravity-dependent. The stresses of gravity contribute to backache, flat feet, varicose veins, and bed sores. Also, the vascular system of the body is sufficiently marginal in some of its functions, so that prolonged sitting may result in swollen feet and rigid standing may cause fainting. With proper exercise routines, there seems to be little reason to feel that the astronaut will be in danger from weightlessness per se. The physiological systems likely to be affected by weightlessness include the musculoskeletal and cardiovascular systems, and the equilibrium senses. Inactivity on the part of the astronaut must be avoided, and space for exercising within the spacecraft must be provided. It is noted that there is some evidence that the changes from acceleration to weightlessness may be more disturbing than continued weightlessness.

A64-24619

SENSORY AND PERCEPTUAL PROBLEMS IN SPACE FLIGHT.

John Lott Brown (Pennsylvania, University, School of Medicine, Dept. of Physiology, Philadelphia, Pa.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 209-230. 51 refs.

U.S. Public Health Service Award No. GM-K3-15277-C2.

Consideration of the sensory and perceptual capabilities of man in relation to the possible tasks which he may be called upon to perform during space flight. Some of the hazards to sensory processes which may be encountered are discussed. The subjects considered include vision at launch, in orbit, and in lunar and interplanetary flight; hazards to vision; hearing hazards; vestibular sense; other senses; and other problems, such as time perception and sensory deprivation.

A64-24620

ISOLATION AND DISORIENTATION.

Randall M. Chambers (U.S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Human Factors Div., Johnsville, Pa.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 231-297. 124 refs.

Review and summary of research on isolation and disorientation as it relates to problems encountered by man during space travel. An attempt is made to identify critical problem areas, to describe significant variables and phenomena, and to systematize the extensive subjective data and inconsistent reports which abound in the scientific literature. The requirements for the physical protection of man during space flight are said to be instrumental in producing the problematic conditions of isolation and disorientation. Even when all instrumentation systems are operating within the spacecraft, the ability of the astronaut to sense gravity, pressure, motion, light, sound, and time cues may be unreliable because of disorientation along some of these parameters. Some of the major procedures for protecting man against the effects of isolation and disorientation during space travel are discussed.

A64-24621**PHYSIOLOGIC RHYTHMS.**

Franz Halberg (Minnesota, University, Medical School, Dept. of Pathology, Minneapolis, Minn.).

IN: PHYSIOLOGICAL PROBLEMS IN SPACE EXPLORATION.

Edited by James D. Hardy.

Springfield, Ill., Charles C. Thomas, Publisher, 1964, p. 299-322. 27 refs.

Research supported by the American Cancer Society; Elsa U. Pardee Foundation; Minnesota Dept. of Public Welfare; U.S. Public Health Service Grants No. 5-K6-GM-13, 981, No. NB-04531-02, and C-4359 C4; Grant No. NSG-517.

Discussion of physiologic rhythms. The subjects considered include scope, generality, and reproducibility of circadian rhythms, deviations from an exact 24-hr period, hormone effects in the light of circadian system analysis, resistance to injury, variance spectra, physiologic rhythms, and bioastronautics. It is stated that problems of physiologic rhythms are pertinent to human engineering for life in aerospace, particularly with respect to astronaut selection and performance. They are so, irrespective of whether this latter time dimension of life on Earth is acquired or innate, while information on the latter problem in itself is a first-order contribution to basic biology. Bioastronautics, it is said, can provide such data and thus fill a gap in present knowledge.

A64-24713**MANNED SPACE FLIGHT - A LOGICAL SEQUEL TO MANNED AIRCRAFT.**

Frank Borman (NASA, Manned Spacecraft Center, Houston, Tex.). Society of Experimental Test Pilots, Technical Review, vol. 7, no. 1, 1964, p. 4-6.

Discussion on the use of the pilot's viewpoint in the development of a manned spacecraft. The point of disagreement between the pilot of the spacecraft and the members of the medical and human engineering personnel is considered: the former believes the space flight should develop functionally out of flight in manned aircraft while the latter contend it to be without close ties to modern aviation experience. It is stated that the pilot's greatest contribution to the experimental program is his past experience in the development and operation of manned aircraft.

A64-24714**AEROSPACE MEDICAL AND BIOENGINEERING CONSIDERATIONS IN LIFTING-BODY AND RESEARCH-AIRCRAFT OPERATIONS.**

Milton O. Thompson (NASA, Flight Research Center, Edwards AFB, Calif.).

(Aerospace Medical Association, Annual Meeting, 35th, Miami Beach, Fla., May 11-14, 1964.)

Society of Experimental Test Pilots, Technical Review, vol. 7, no. 1, 1964, p. 7-14.

Presentation of the operating problems involved. A lifting-body research vehicle is described and illustrated. An indirect vision system is considered, and general comments are made with respect to cockpit design in terms of pilot control requirements and improvement in the presentation of flight information. Other topics mentioned are protective equipment, escape systems, medical monitoring, and crew selection and evaluation. No problems unique to the lifting body are foreseen.

A64-24715**LIFE SCIENCE REQUIREMENTS FOR DYNA-SOAR AND SIMILAR PROGRAMS.**

James W. Wood (USAF, Washington, D.C.).

Society of Experimental Test Pilots, Technical Review, vol. 7, no. 1, 1964, p. 15-18.

Discussion of cockpit equipment and systems design for Dyna-Soar. Design of equipment is considered with vehicle systems and the overall operational concept as a guiding force. The pressure suit design was dictated by the operation of flight controls. The helmet worn is described. A point is made of the importance of the individual pilot's participation with aeromedical and human engineering personnel for the satisfactory design of the cockpit and crew protection. The escape system and the reason for its choice are discussed. The role of medical monitoring is mentioned with respect to the boost and re-entry phase of the flight, the pilot's physical status, and the condition of his life support system.

A64-24716**SOME CHALLENGES TO THE AEROSPACE MEDICAL ASSOCIATION FROM A LIGHT ATTACK PILOT.**

Robert R. King, Jr. (U.S. Navy, Washington, D.C.).

Society of Experimental Test Pilots, Technical Review, vol. 7, no. 1, 1964, p. 19-26.

Presentation of problems faced by the pilot of a light attack plane as defined. The problems requiring solution by the Aerospace Medical Association are discussed: (1) combat effectiveness (fatigue of pilots, inadequate cockpit size, navigation, and target identification), (2) pilot efficiency (optimum work hours, optimum training periods, and at-sea deployment schedules), (3) flight safety (target hypnosis, reflection of light, external lighting, and cockpit design), (4) pilot comfort (oxygen masks and flight gloves), and (5) survival (smaller and standardized equipment).

A64-24717**A TEST PILOT'S VIEWPOINT OF AEROSPACE BIOENGINEERING AS APPLIED TO CURRENT COMMERCIAL TRANSPORTS.**

James R. Gannett (Boeing Co., Seattle, Wash.).

Society of Experimental Test Pilots, Technical Review, vol. 7, no. 1, 1964, p. 27-31.

Review of items needing improvement in today's aircraft so as to prepare for the supersonic aircraft. Mentioned are: (1) data displays which have inadequate readabilities and excessive time constants; (2) displays that do not aid the pilot under flight conditions when he needs help most; (3) aircraft handling qualities; (4) use of devices that do not properly feed information to the pilot, especially at times of heavy concentration; and (5) the autopilot with its controls and mechanization. Lack of a definitive and quantitative standard is discussed. The evaluation pilot is urged to acquaint himself with the fundamentals of human engineering so as to aid in the development of standards.

A64-24819**NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS.**

Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964. 313 p. \$10.

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THE DESIGN AND EVALUATION OF PROBABILISTIC INFORMATION PROCESSING SYSTEMS. Ward Edwards (Michigan, University, Ann Arbor, Mich.), p. 169-181.

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MODERN CONTROL SYSTEM THEORY AND HUMAN CONTROL FUNCTIONS. R. W. Obermayer and F. A. Muckler (Martin Marietta Corp., Baltimore, Md.), p. 191-210. 30 refs. [See A64-24837 20-14]

ADAPTIVE AIDING - A NEW METHOD OF AIDING FOR DISCRETE MANUAL TRACKING. James G. Rogers (Hughes Aircraft Co., Fullerton, Calif.), p. 211-223. 38 refs. [See A64-24838 20-08]

HUMAN FACTORS AND ELECTRONIC PROBLEMS IN THE DESIGN OF EXTERNALLY-POWERED ARTIFICIAL ARMS. Hilde Groth and John Lyman (California, University, Los Angeles, Calif.), p. 224-228.

CONTROL MODELS OF CREATURES WHICH LOOK AHEAD. T. B. Sheridan, W. M. Johnson, A. C. Bell, and J. G. Kreifeldt (Massachusetts Institute of Technology, Cambridge, Mass.), p. 229-240. [See A64-24839 20-14]

A MODEL OF HUMAN CONTROLLER PERFORMANCE IN A RELAY CONTROL SYSTEM. Richard W. Pew (Michigan, University, Ann Arbor, Mich.), p. 241-251. 7 refs. [See A64-24840 20-14]

AN ADAPTIVE MODEL OF THE HUMAN OPERATOR IN A CONTROL SYSTEM. D. E. Knoop and K. S. Fu (Purdue University, Lafayette, Ind.), p. 252-265. 6 refs. [See A64-24841 20-14]

THE ADAPREDICTIVE SYSTEM OF ORBITAL TRAJECTORY CONTROL. E. A. Ulbrich (North American Aviation, Inc., Downey, Calif.), p. 266-276. 7 refs. [See A64-24842 20-30]

A GENERAL PURPOSE LABORATORY MACHINE FOR HUMAN FACTORS SIMULATION. K. Goldschmidt (Bell Telephone Laboratories, Inc., Holmdel, N.J.), p. 277-287.

ENGINEERING TECHNIQUES FOR SPACE CABIN DESIGN.

D. Amorelli, J. T. Celentano, and B. G. Peters (North American Aviation, Inc., Downey, Calif.), p. 288-293. 13 refs. [See A64-24843 20-10]

THE DECISION-MAKING FUNCTION IN SYSTEM SIMULATION - AN APPROACH. John D. Hodges, Jr. (North American Aviation, Inc., Downey, Calif.), p. 294-303. 5 refs. [See A64-24844 20-14]

THE USE OF MAN/MACHINE INTERACTION MODELS IN SHORTENING SYSTEM DEVELOPMENT CYCLES. J. F. Brown, W. E. Feroglia, and R. A. Seitle (Philco Corp., Palo Alto, Calif.), p. 304-313. [See A64-24845 20-14]

A64-24820

HUMAN FACTORS IN ELECTRONICS.

Eugene B. Konecci (NASA, Office of Advanced Research and Technology, Biotechnology and Human Research, Washington, D.C.). IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS.

Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers.

North Hollywood, Calif., Western Periodicals Co., 1964, p. 1-6.

Discussion of the human factors element in the space system effort. The need to organize and properly reduce research information is considered. The amount of research that can be performed in advance of system construction and the direction that it should follow for maximum applicability are discussed. The need for a greater understanding of the capabilities and limitations of man is indicated.

A64-24821

TOWARDS A THEORY OF THE RETICULAR FORMATION.

W. L. Kilmer and W. S. McCulloch (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers.

North Hollywood, Calif., Western Periodicals Co., 1964, p. 7-25. 63 refs.

Contracts No. DA 36-039 AMC 03200(E); No. AF 33(616)-7783; No. AF 19(628)-3807; National Institutes of Health Grants No. NB 04985-01; No. MH 0473703; NSF Grant No. G 16526; Grant No. NsG 496.

Analysis of the circuit action of the reticular formation. It is indicated that, although the anatomy, or wiring diagram, of the reticular formation is fairly well-known, no theory has been proposed to date that accounts for its known performance. Its basic structure is that of a string of similar modules, connected not merely from module to adjacent module, but by long jumpers between distant modules. As a model, probabilistic automata which handle regular events as proper modules are proposed. Several stability theories regarding these automata are presented.

A64-24822

A DIGITAL COMPUTER TECHNIQUE FOR OPERATOR PERFORMANCE STUDIES.

L. T. Gregg (General Dynamics Corp., General Dynamics/Astronautics, San Diego, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 44-51. 5 refs.

Description of a technique for simulation of operator performance in man-machine systems utilizing Boolean algebra and a digital computer. The sequential dependencies between operator responses and machine functions are modeled in Boolean algebra as

- a set of cause-effect-time relationships. Interpretation of the model by a digital computer produces a time history of the binary states of all system variables. The technique is being used to predict operator performance on a laboratory control/display simulator. A general theory of operator performance is discussed which is based on the theory of stimulus-response, a normal scanning pattern of displays, the use of stress as a trigger of alternate behavior chains which are represented by alternate logical event sequences, and a model of the human as a set of relays or switching functions.

A64-24823

AN ELECTRONIC NETWORK WHICH EMULATES CONDITIONED REFLEX.

R. L. Preger and K. C. Wehr (Westinghouse Electric Corp., Surface Div., Baltimore, Md.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 52-62. 7 refs.

Discussion of a model of the conditioned reflex. The results of a computer simulation of an electronic network which attempts to duplicate the phenomenon of conditioned reflex are described. The model consists of 100 polystable elements, each element being a state-defined digital sequential circuit. The elements of the simulated model are independent and are individually defined by separate and different state transition tables whose characteristics are described by probabilistic design parameters. In operation, the model develops the conditioned reflex by establishing a relationship between a conditioning stimulus and a reinforcement stimulus and does not inherently contain the reflex. The conditioning stimulus is defined by any arbitrary pattern appropriately encoded as inputs for each of the polystable elements. Similarly, the reinforcement pattern defines the desired conditioned response for each element.

A64-24824

ON THE EVOLUTION OF ARTIFICIAL INTELLIGENCE.

L. J. Fogel, A. J. Owens, and M. J. Walsh (General Dynamics Corp., General Dynamics/Astronautics, San Diego, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 63-76. 7 refs.

Discussion of the behavior of a simulated automaton which carries out a fast-time replication of some aspects of natural evolution using finite-state machines as the "organisms." "Offspring" are produced through mutation, scored in their ability to achieve a given goal in the available experience, and a selection is made of the best few which then serve as "parents." Continual improvement is ensured through the retention of each parent until an equally good or superior offspring is found. The evolutionary process is repeated for a number of generations for each new stimulus-response transduction process.

A64-24825

IMPROVED TECHNIQUES FOR QUANTIFICATION OF BIOELECTRIC PHENOMENA.

Robert G. Eason (San Diego State College; U.S. Navy, Electronics Laboratory, San Diego, Calif.), John A. Hoke, and Carroll T. White (U.S. Navy, Electronics Laboratory, San Diego, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 81-86. 5 refs.

Description of techniques for the quantification of such bioelectric data as the electrical activity of skeletal muscles, skin, and heart. The measurement of the action potentials from various muscle groups as possible indicators of fatigue and activation level, taken either singly or in various combinations, is outlined. A heart-beat counter and a rotary pursuit tracking scoring system are also described.

A64-24831

APPLICATIONS OF HEAD-WORN DISPLAYS TO SPECIALIZED DISPLAY PROBLEMS AND MINIATURIZED DISPLAY SYSTEMS.

R. J. Hall (Hughes Aircraft Co., Ground Systems Group, Fullerton, Calif.), James W. Miller (U.S. Navy, Office of Naval Research, Washington, D.C.), and Dennis R. Musselman (Humboldt State College, Arcata, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 120-127. 7 refs.

Discussion of some recent modifications and experimental evaluations of the "Electrocular" head-mounted display system. The primary purpose of the experimental program was to compare the mean detection frequency of a group of subjects monitoring the "Electrocular" display with that of a second group tested on the conventional console display. The study also compared the vigilance decrement functions of the two display groups. The apparatus was designed to provide a task which would resemble the task of initial target detection in field radar surveillance situations.

A64-24832

A DEVICE FOR REMOTE MONITORING OF HELMET POSITION.

Charles P. Greening, James S. Sweeney, and Harry L. Snyder (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 138-142. 7 refs.

Description of a device which senses the direction of a pilot's line-of-sight remotely, by monitoring his helmet position. The helmet-position sensing system (HELP) consists of a helmet-mounted transmitter, a vehicle-mounted receiver, and appropriate electronic components. The helmet-mounted transmitter is an incandescent bulb mounted behind a polaroid sheet. The receiver consists of a motor-driven polaroid sheet with a polaroid-covered light source, and two photoelectric cells. If the helmet-mounted and reference polaroids have their planes of polarization aligned, then the output of each photoelectric cell is a cosine-squared wave, and the two outputs are in phase. As the head is rotated, the two transmitter polaroids no longer have their polarizing planes aligned, and the two cosine-squared waves go out of phase. A phase detector is used to sense the phase difference between the two photocell outputs. The phase detector's output is a dc voltage which is linearly proportional to the angular difference. Test data obtained with this device are presented.

A64-24833

ADAPTIVE CHARACTERISTICS OF THE HUMAN CONTROLLER IN SYSTEMS HAVING COMPLEX DYNAMICS.

J. I. Elkind, J. A. Kelly, and R. A. Payne (Bolt Beranek and Newman, Inc., Cambridge, Mass.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 143-159. 14 refs.

Contracts No. AF 33(657)-10124; No. NASW 668.

Presentation of a sampled-data model for the human controller in both time-invariant and time-varying control systems. The time-invariant model is based on the Young eye movement model and the Lemay-Wescott hand-tracking model. It has a pursuit channel that provides memory for making smooth almost continuous movements, a saccadic channel for making sudden step movements, and a force programmer for driving the muscle-hand system. The variable parameters of the model are identified, and the model is extended to systems having time-varying controlled-element dynamics in which the human controller adjusts his characteristics to compensate for the variations in these dynamics. Experimental data are presented which demonstrate that for sudden changes in dynamics, the human controller's adaptive process is composed of four phases: detection of a change, stabilization, reduction of accumulated errors, and optimization of dynamics.

A64-24834

PRELIMINARY EXPERIMENTS IN TELECONFERENCING.

H. Wallace Sinaiko (Institute for Defense Analyses, Washington, D.C.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 160-162. 6 refs.

Experimental study of the use of teleconferencing as an efficient means of group communication. Teleconferencing refers to the conduct of conferences when: there are three or more conferees, conferees are remote from one another, and not all participants speak the same language. The Institute for Defense Analyses performed a study to learn: whether interim procedures could be specified to enable teleconferences to be conducted efficiently in the near future and what additional research was needed to fill gaps in current knowledge relevant to teleconferencing. A laboratory for conducting experiments in teleconference procedures was established, and five series of experiments run. The laboratory work included teletype, telephone, and television communications media and was done to provide flexible means for varying network structures, chairmanship roles, language services, and conference tasks. It was found that, for negotiation or bargaining among remote conferees the most impersonal media were preferred.

A64-24835

NONACOUSTIC MEASURES IN AUTOMATIC SPEECH RECOGNITION

W. A. Hillix (U.S. Navy, Electronics Laboratory; San Diego State College, San Diego, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 163-168. 7 refs.

Discussion of four nonacoustic low-bandwidth measures of events associated with speaking. The four measures developed are: (1) a lip reader based on a cadmium sulphide photoresistor, (2) a hot wire anemometer which uses the filament of a light bulb as the sensing element, (3) a throat microphone used to indicate voicing, and (4) a nose microphone providing an indication of nasalization. It is possible to recognize decimal digits spoken by a single speaker either by looking at recorded waveforms showing the values of these four measures, or automatically, via a computer program that matches incoming waveforms to labeled samples. It is felt that the measures developed may have practical usefulness in automatic speech recognition when used in conjunction with acoustic information.

A64-24837

MODERN CONTROL SYSTEM THEORY AND HUMAN CONTROL FUNCTIONS.

R. W. Obermayer and F. A. Muckler (Martin Marietta Corp., Martin Co., Baltimore, Md.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 191-210. 30 refs.

Contract No. NASW 869.

Discussion of the relations between modern optimal control theory and manual control systems. The theory is presented, and the fundamental control problem is stated. The techniques of Pontryagin, Bellman, and Kalman are used in an attempt to solve it. Difficulties in defining the physical problem are discussed. The application to manual control systems is presented. The human element in the system is studied, and an attempt is made to establish a structured approach to control systems synthesis involving manual control.

A64-24839

CONTROL MODELS OF CREATURES WHICH LOOK AHEAD.

T. B. Sheridan, W. M. Johnson, A. C. Bell, and J. G. Kreifeldt (Massachusetts Institute of Technology, Dept. of Mechanical Engineering, Cambridge, Mass.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 229-240. Grant No. NSG 107-61.

Description of several models which characterize the ability of the human operator to anticipate transients in his input which are faster than his own process response. It is felt that conventional servomechanism models of pursuit and compensatory tracking do not cope with the ability of humans (and animals) to "look ahead" in performing control tasks. Results of some initial experiments with "look ahead" models are described and compared with human response data.

A64-24840

A MODEL OF HUMAN CONTROLLER PERFORMANCE IN A RELAY CONTROL SYSTEM.

Richard W. Pew (Michigan, University, Dept. of Psychology, Human Performance Center, Ann Arbor, Mich.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 241-251. 7 refs.

Contracts No. AF 49(638)-449; No. AF 49(638)-1235.

Experimental investigation of the use of a switching line analysis in the phase plane as a technique for characterizing certain aspects of human controller performance in the operation of a bi-stable relay control system. When a human operator attempts to control the position of a target with such a system, his control output consists of a temporal sequence of relay switching operations. The shape of the switching lines suggests that the operators use predictive information derived from the error signal in order to achieve stable system performance. Their limited rate and inherent variability in response timing combine to produce a switching performance which is less than optimal in comparison with what a physical control system could achieve given the same error information.

A64-24841

AN ADAPTIVE MODEL OF THE HUMAN OPERATOR IN A CONTROL SYSTEM.

D. E. Knoop and K. S. Fu (Purdue University, School of Electrical Engineering, Control and Information Systems Laboratory, Lafayette, Ind.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif., Western Periodicals Co., 1964, p. 252-265. 6 refs.

NSF Grant No. GP 2183; Contract No. AF AFOSR 62-351.

Study of the problem of having a human operator controlling a time-varying plant. Adaptation of the human operator to both discrete and continuous plant variation is investigated. A nonlinear system is proposed as a mathematical model to explain the manner by which a human operator controls a time-varying plant. It is proposed that the human controller is a model adaptive system and used a series of predicted "control intervals" based on the model state. A GEDA/IBM 1710 hybrid system has been employed to aid in experimental verification of the proposed model. Results of typical experiments using second-order plants with one time-varying parameter are presented in graphical form. Time and frequency response curves of operator parameter variations due to plant variations are presented to illustrate the adaptive nature of the human operator.

A64-24844

THE DECISION-MAKING FUNCTION IN SYSTEM SIMULATION - AN APPROACH.

John D. Hodges, Jr. (North American Aviation, Inc., Space and Information Systems Div., Life Sciences Dept., Downey, Calif.).

IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers.

North Hollywood, Calif., Western Periodicals Co., 1964, p. 294-
303. 5 refs.

Study of the decision-making subfunctions for simulated command and control systems. The operational elements of a command and control system are organized into the following subsystem functions: data gathering, data processing, information display, decision-making, decision implementation, feedback of results, and communications. In general, decision-making in systems can be divided into four categories: automated decision areas, programmed human decision areas, decisions under uncertain conditions, and system override situations. It is recommended that three types of decision processes should be simulated in the analysis of such systems. They are those required to accommodate: (1) the predetermined or high probability decision situations where procedures, techniques, and alternates can be established before their required use; (2) the undeterminable situations that cannot be predicted; and (3) the readjustment of predetermined decision structures to accomplish better system goals.

A64-24845**THE USE OF MAN/MACHINE INTERACTION MODELS IN SHORTENING SYSTEM DEVELOPMENT CYCLES.**

J. F. Brown, W. E. Feroglia, and R. A. Seitle (Philco Corp., Western Development Laboratories, Palo Alto, Calif.).
IN: NATIONAL SYMPOSIUM ON HUMAN FACTORS IN ELECTRONICS, 5TH, SAN DIEGO, CALIF., MAY 5, 6, 1964, PROCEEDINGS. Sponsored by the Professional Technical Group on Human Factors in Electronics of the Institute of Electrical and Electronics Engineers. North Hollywood, Calif.; Western Periodicals Co., 1964, p. 304-313.

Presentation of an approach to preliminary system design. It is felt that through the development of a versatile model to describe the system's man/machine interactions, the selection of a flexible display concept, and frequent information interchange between the hardware and analysis engineering groups, the information requirements analysis and the hardware design development phase can run concurrently. The procedure is illustrated by demonstrating its application in solving the problem of developing the display system design for NASA's Integrated Mission Control Center (IMCC).

A64-24944**EXOBIOLOGY - A CRITICAL REVIEW.**

Carl Sagan (Harvard University; Smithsonian Institution, Smithsonian Astrophysical Observatory, Cambridge, Mass.).
IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.
Sponsored by the Committee on Space Research (COSPAR). Edited by M. Florkin and A. Dollfus.
Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 35-53. 63 refs.

Discussion of the possibility of existence of extraterrestrial life. The subjects considered include the origin of life, the likelihood of living systems in contemporary extraterrestrial environments, direct evidence of extraterrestrial life, and additional references. It is concluded that the issues on the existence of exobiologic life are largely unresolved, and that, perhaps, a definitive resolution will not be obtained until spacecraft are landed on the Martian surface. Experimental design of automatic instrumented biological landing packages is already underway.

A64-24948**BACTERIA UNDER SIMULATED MARTIAN CONDITIONS.**

R. S. Young, P. H. Deal, J. Bell, and J. L. Allen (NASA, Ames Research Center, Moffett Field, Calif.).
IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.
Sponsored by the Committee on Space Research (COSPAR). Edited by M. Florkin and A. Dollfus.
(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 105-111. 9 refs.
[For abstract see Accession no. A63-18972 17-16]

A64-24949**MULTIVATOR - A BIOCHEMICAL LABORATORY FOR MARTIAN EXPERIMENTS.**

E. Levinthal, L. Hundley, and J. Lederberg (Stanford University, Genetics Dept., Instrumentation Research Laboratory, Stanford, Calif.).
IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR). Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 112-123.

Grant No. NSG 81-60.

[For abstract see Accession no. A63-18968 17-16]

A64-24950**"GULLIVER" - AN EXPERIMENT FOR EXTRATERRESTRIAL LIFE DETECTION AND ANALYSIS.**

G. V. Levin, A. H. Heim, M. F. Thompson, D. R. Beem (Hazleton Laboratories, Inc., Falls Church, Va.), and N. H. Horowitz (California Institute of Technology, Pasadena, Calif.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 124-132.

Contract No. NASr-10.

[For abstract see Accession no. A63-18574 16-16]

A64-24951**THE DESIGN OF MARTIAN BIOLOGICAL EXPERIMENTS.**

N. H. Horowitz (California Institute of Technology, Pasadena, Calif.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 133-138. 14 refs.

[For abstract see Accession no. A63-18924 17-16]

A64-24969**THE EFFECT OF LOW TEMPERATURES ON THE STRUCTURE OF ENZYMES.**

G. T. Voronov (Academy of Sciences, Institute of Microbiology, Moscow, USSR).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 261-266. 15 refs.

Description of the polarographic analysis of protein solutions at temperatures below zero. It is stated that the enzymes of the cold stable organisms possess lower levels of activation energy. The possibility of the adaptation of living creatures to low temperatures is associated with the structural alterations in proteins and enzymes. It is noted that polarographic studies on yeast alcohol dehydrogenase and on proteinase of *B. Subtilis* at low temperatures have demonstrated that the lowering of temperature causes significant structural changes in the molecule of the protein.

A64-24970

EFFECTS OF GRAVITY ON THE FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM.

W. R. Adey (California, University, Brain Research Institute, Space Biology Laboratory, Los Angeles; Veterans Administration Hospitals, Long Beach and Los Angeles, Calif.).
IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 267-286. 37 refs.

Grants No. AF AFOSR 61-81; No. NSG 203-62.

[For abstract see Accession no. A63-18960 17-16]

Discussion of the problem of the transport of viable germs through interplanetary space as related to the sterilization of spaceships. The following considerations are made: (1) Of all cosmic extremal factors, UV solar radiation is the most dangerous for microorganisms. The intensity of the most bactericidal region of UV radiation at a distance of 1 astronomical unit from the Sun is 2×10^3 erg/cm². (2) The sensitivity of microorganisms to UV rays varies in a large range. For the most resistant forms, the lethal dose is approximately 440,000 erg/cm². (3) The penetrating capacity of UV radiation is very low, and therefore, even insignificant amounts of organic or mineral substances may protect the bacterial cell. (4) Dust particles of terrestrial origin carrying on themselves bacterial spores exert upon the latter a protective effect against UV radiation.

A64-24974

THE ACTION OF MAGNETIC FIELD ON THE SODIUM TRANSPORT ACROSS THE CELL MEMBRANE.

T. Gualtierotti and V. Capraro (Milano, Università, Istituto di Fisiologia Umana e Generale, Milan, Italy).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 311-316.

[For abstract see Accession no. A63-18961 17-16]

A64-24971

CARDIOVASCULAR DECONDITIONING - ROLE OF BLOOD VOLUME AND SYMPATHETIC NEUROHORMONES.

D. E. Graveline (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 287-298. 29 refs.

Demonstration, by means of studies of prolonged bed rest and water immersion, that serious deconditioning of certain gravity-oriented biologic systems occurs with extended exposures to environments in which the necessity for gravity compensation has been reduced. It is stated that the precise physiologic mechanisms responsible for the loss of orthostatic tolerance following such studies are unknown, but may be related to diminished blood volume, decreased muscle or tissue pressure in the extremities, or to functional alterations in the sympathetic nervous system. It is noted that, in view of the fact that norepinephrine is the principal agent for maintaining vascular tone, attention has been focused on the sympathetic nervous system as being the system most likely responsible for the loss of orthostatic tolerance following such experiments. The contributory effects of diminished circulating blood volume resulting from such environments are also discussed.

A64-24972

CALCIUM METABOLISM UNDER CONDITIONS OF WEIGHTLESSNESS.

W. F. Neuman (Rochester, University, Medical Center, Dept. of Radiation Biology, Rochester, N.Y.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 299-304. 8 refs.

[For abstract see Accession no. A63-18927 17-16]

A64-24973

EFFECT OF ULTRAVIOLET RADIATION ON MICROORGANISMS AS A PRINCIPAL EXTREMAL FACTOR OF SPACE ENVIRONMENT.

R. I. Fedorova (Academy of Sciences, Institute of Microbiology, Moscow, USSR).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 305-310.

A64-24975

THE VESTIBULAR FUNCTION IN CONDITIONS OF ZERO GRAVITY.

T. Gualtierotti and R. Margaria (Milano, Università, Istituto di Fisiologia Umana e Generale, Milan, Italy).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 317-322. 6 refs.

[For abstract see Accession no. A63-18565 16-16]

A64-24976

USE OF ALGAE FOR SUPPORT OF THE HUMAN IN SPACE.

J. Myers (Texas, University, Austin, Tex.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 323-336. 23 refs.

[For abstract see Accession no. A63-18926 17-16]

A64-24977

HUMAN RELIABILITY AND CONFINEMENT.

George T. Hauty (Federal Aviation Agency, Civil Aeromedical Research Institute, Oklahoma City, Okla.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 337-351.

[For abstract see Accession no. A63-18957 17-14]

A64-24978

BIOLOGICAL CONTAMINATION OF MARS. I - SURVIVAL OF TERRESTRIAL MICROORGANISMS IN SIMULATED MARTIAN ENVIRONMENTS.

S. Scher, E. Packer, and C. Sagan (California, University, Space Sciences Laboratory, Berkeley, Calif.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 352-356. 9 refs.

Grants No. NSG 126-61.

Investigation of the likelihood of biological contamination of Mars, through application of the principle of natural selection on a laboratory scale. Terrestrial microorganisms were collected from a variety of environments, including regions of high alkalinity, low mean daily temperature, and low annual rainfall. The air-dried soils were then subjected to a simulated Martian environment involving 12-hour freeze-thaw cycles from about -60°C to about +20°C; atmospheres of 95% nitrogen, 5% carbon dioxide, and low moisture content. Survivors were scored on supplemented agar. Preliminary results are said to indicate a wide variety of survivors, even when no organic supplements were introduced. Survivors included obligate and facultative spore formers and nonsporeforming facultative anaerobic bacteria. Diurnal freezing and thawing were continued for 6 months. There was no significant loss of viability after the first freeze-thaw cycle. The results obtained are said to show the absence of pronounced synergistic effects inhibiting survival. The probable existence of organic matter and moisture on Mars, at least in restricted locations and times, makes it likely that terrestrial microorganisms can also reproduce on Mars.

A64-24979

SOME BIOLOGICAL AND PHYSICAL FACTORS IN DRY HEAT STERILIZATION - A GENERAL REVIEW.

C. W. Bruch (Schwarz Laboratories, Inc., Mount Vernon, N.Y.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 357-371. 21 refs.

[For abstract see Accession no. A63-18564 16-16]

A64-24980

EXPOSURE OF MICROORGANISMS TO SIMULATED EXTRA-TERRESTRIAL SPACE ECOLOGY.

G. J. Silverman, N. S. Davis (Massachusetts Institute of Technology, Cambridge, Mass.), and W. H. Keller (National Research Corp., Cambridge, Mass.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 372-384. 12 refs.

Contract No. NASr-41.

[For abstract see Accession no. A63-18578 16-16]

A64-24981

A GENERAL REVIEW OF CHEMICAL STERILIZATION IN SPACE RESEARCH.

J. B. Opfell (Dynamic Science Corp., South Pasadena, Calif.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 385-405. 76 refs.

[For abstract see Accession no. A63-18737 17-07]

A64-24982

PROBLEMS IN STERILIZATION OF UNMANNED SPACE VEHICLES.

L. D. Jaffe (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 406-432. 61 refs.

[For abstract see Accession no. A63-18964 17-16]

A64-24983

GNOTOBIOTIC TECHNIQUES AND THEIR APPLICATION TO SPACECRAFT FABRICATION.

P. C. Trexler (Yeshiva University, Albert Einstein College of Medicine, Bronx, N.Y.).

IN: LIFE SCIENCES AND SPACE RESEARCH II; INTERNATIONAL SPACE SCIENCE SYMPOSIUM, 4TH, WARSAW, POLAND, JUNE 3-12, 1963.

Sponsored by the Committee on Space Research (COSPAR).

Edited by M. Florkin and A. Dollfus.

(COSPAR, International Space Science Symposium, 4th, Warsaw, Poland, June 3-12, 1963, Paper.)

Amsterdam, North-Holland Publishing Co.; New York, Interscience Publishers, 1964, p. 433-439. 9 refs.

Army-supported research.

[For abstract see Accession no. A63-18970 17-16]

A64-25007

IMPORTANCE OF EYE DISEASES IN THE SCREENING OF FLYING PERSONNEL [IMPORTANCIA DE LAS AFECIONES OCULARES EN LA SELECCION DEL PERSONAL DE VUELO].

José María Arriaga Cantullera.

Revista de Aeronáutica y Astronáutica, vol. 24, July 1964, p. 565-572. In Spanish.

Presentation of the results of the examination of the files of 325 air force candidates rejected for various diseases, 53.84% of whom were rejected for eye diseases. The breakdown of the various eye conditions found is as follows: (1) refractory defects - 71.43%, (2) disturbances of chromatic perception - 25.14%, (3) cataracts - 1.28%, (4) central leukomas - 1.28%, (5) atrophy of the optical nerve - 0.64%, and (6) conjunctivitis with blepharitis - 0.64%.

A64-25202

CONTROL-DISPLAY-SUBJECT INTERACTION AND PERFORMANCE ON A COMPLEX PERCEPTUAL-MOTOR TASK.

David S. Abbey (Defence Research Medical Laboratories, Toronto, Canada).

Ergonomics, vol. 7, Apr. 1964, p. 151-164. 20 refs.

Summary of results from two experiments employing the Toronto Complex Coordinator, a device to show the interaction between a human operator (S) and control-display (C-D) linkages. A method of describing tasks in terms of a C-D-S matrix is described and illustrated with 16 such combinations. Experimental tests confirm the accuracy of predictions of relative performance levels made from entries in these matrices. It is also shown that the use of this form of task analysis may be extended to other tracking systems, such as the Two-Hand Coordinator, to predict accurately the optimum C-D linkage and location of the controls relative to S and D.

A64-25261**THE ORIGIN OF LIFE IN SPACE.**

A. I. Oparin (Academy of Sciences, Institute of Biochemistry, Moscow, USSR).

Space Science Reviews, vol. 3, July 1964, p. 5-26. 53 refs.

Discussion of the possible conditions which led to the origin of life on Earth and of the possible existence of similar conditions elsewhere in the universe. The formation of the elements and of the planets is discussed, and evidence indicating the vast abundance of carbon in space is noted. The origin on Earth of primitive organic substances is considered, as are the complication of these compounds through polymerization or condensation in the waters of the primary hydrosphere, and the formation in the hydrosphere of polymolecular complexes which served as initial systems for the formation of primary living organisms. Laboratory experiments attempting to reproduce these conditions and processes are reviewed, and the possibility that similar conditions exist or have existed elsewhere in the universe, including Mars, is briefly considered.

A64-25317**BIOCYBERNETICS.**

Gordon B. Thomas (United Aircraft Corp., Hamilton Standard Div., Bio-Sciences and Technology Dept., Windsor Locks, Conn.).
(American Academy of Occupational Medicine, Annual Meeting, 16th, Hartford, Conn., Feb. 5-7, 1964.)

Archives of Environmental Health, vol. 9, Sept. 1964, p. 298-302.

Discussion of the field. The term is denoted as a fusion of the methods of the feedback engineering analyst with those of the biologist. Some factors in the biological system that affect the mathematical analysis are mentioned with an example given. A discussion of cardiovascular systems and calcium metabolism dynamics is presented in which an attempt is made to establish models that can be used to make predictions about the performance of the system under the conditions that an individual encounters in outer space. Block diagrams of the systems considered are presented. It is stated that all rate determinations that are required for the calculations can be made on the human before, during, and after the flight.

A64-25318**DEVELOPMENTS IN PHOTOSYNTHESIS.**

Sherwood C. Lewis (United Aircraft Corp., Hamilton Standard Div., Space and Life Systems Dept., Windsor Locks, Conn.).
(American Academy of Occupational Medicine, Annual Meeting, 16th, Hartford, Conn., Feb. 5-7, 1964.)

Archives of Environmental Health, vol. 9, Sept. 1964, p. 308, 309.

Discussion of the history. Beginning with Priestly (1722), the development of the concepts of photosynthesis is given. The work of Van Niel, Calvin, and Arnon which aided in the understanding of this process is mentioned. Other work which led to the discovery of missing steps, as well as the requirements and activities involved in photosynthesis, is considered.

A64-25319**ENVIRONMENTAL PHYSIOLOGY OF SUBMARINES AND SPACE-CRAFT.**

K. E. Schaefer (U.S. Naval Medical Research Laboratory, Physiology Branch, Submarine Base New London, Groton, Conn.).
(American Academy of Occupational Medicine, Annual Meeting, 16th, Hartford, Conn., Feb. 5-7, 1964.)

Archives of Environmental Health, vol. 9, Sept. 1964, p. 320-331. 44 refs.

Report of an investigation. The problems in the provision of an acceptable atmospheric environment are discussed. The following topics are considered: (1) human tolerance limits to CO₂ for continuous exposure, with results of the test presented; (2) breathing pattern and dead spaces in chronic CO₂ exposure; (3) acid-base balance and electrolyte shifts; (4) blood pH and pCO₂ homeostasis; (5) time concentration relationship to CO₂ toxicity; (6) conclusions from chronic CO₂ studies; (7) carbon monoxide; (8) toxic trace substances in confined spaces and TLV values for continuous exposure, and (9) aerosols and ions. Additional problems encountered in the choice of atmospheric conditions for spacecraft are discussed as well as hazards involved including bends, fire, and micrometeorite penetration.

A64-25320**HUMAN RESPONSES TO HEAT STRESS.**

Paul E. Smith, Jr. (Du Pont de Nemours and Co., Inc., Haskell Laboratory for Toxicology and Industrial Medicine, Physics Section, Wilmington, Del.) and Edward W. James, II (Du Pont de Nemours and Co., Inc., Engineering Dept., Wilmington, Del.).

(American Academy of Occupational Medicine, Annual Meeting, 16th, Hartford, Conn., Feb. 5-7, 1964.)

Archives of Environmental Health, vol. 9, Sept. 1964, p. 332-342. 9 refs.

Discussion of a model. A dynamic mathematical model of the human heat-transfer system which has been developed and programmed for analog simulation is considered as well as the concepts on which it is based. Variables are injected into the system by means of appropriate voltages. Heat transfer between parts is considered to take place through the medium of flowing blood, and mechanisms for this exchange are given along with a definition of the flows involved. Postulates and theories are presented which lead to programmed mechanisms and functions that can bring about control of body temperature. A portion of the computer program developed from the concepts outlined is depicted and discussed. The results of the program are presented and graphically compared with measurements obtained from human subjects.

A64-25345**ESTIMATION AND REPRODUCTION OF ANGLES FROM A GIVEN LINE OF REFERENCE.**

O. Logan (Defence Research Medical Laboratories, Toronto, Canada).

Perceptual and Motor Skills, vol. 18, 1964, p. 231-234.

Report of an investigation. The results of previous experiments and the conclusions drawn are presented. The procedure for the present experiment is given. The data are presented in graphical form and show the mean estimation errors vs the angles measured for all subjects tested. Also shown is a table giving an analysis of variance of estimation and reproduction of angles. The results show that errors in estimation increased as the angle increased, except for the 90° angle. Underestimation was the greatest source of error and increased toward the 75° angle. The lower error at small angles is attributed to their greater use in everyday skills.

A64-25346**BEHAVIORAL CHANGES AFTER PROLONGED PERCEPTUAL DEPRIVATION (NO INTRUSIONS).**

John P. Zubek (Manitoba, University, Winnipeg, Manitoba, Canada).

Perceptual and Motor Skills, vol. 18, 1964, p. 413-420. 22 refs.

Research supported by the Defence Research Board, Canada.

Report of an investigation. Previous experiments are discussed, and a procedure for testing a hypothesis arising from them is given. The general arrangement of the facilities, condition of the subjects, and tests which consisted of a battery of perceptual-motor tests before and immediately after isolation are described. The results are presented, including: (1) qualitative observations and a discussion of the aftereffects, and (2) quantitative observations and a table showing the mean performance of the test and control groups. Changes were noted in the autokinetic effect and the tactus acuity of both the index finger and the forearm. A discussion of the results is given.

A64-25432**EFFECTS OF PROLONGED SENSORY AND PERCEPTUAL DEPRIVATION.**

J. P. Zubek (Manitoba, University, Dept. of Psychology, Winnipeg, Manitoba, Canada).

British Medical Bulletin, vol. 20, no. 1, 1964, p. 38-42. 61 refs.

Research supported by the Defence Research Board of Canada.

Discussion of the McGill procedure of perceptual deprivation in which the subject typically lies on a cot in a cubicle and wears gloves and translucent goggles. The goggles permit diffuse light to enter the eyes but eliminate all pattern vision. A masking sound, usually white noise, is piped into both ears, and the intensity of both light and noise is maintained at a constant level. Such perceptual deprivation experiments were used to investigate symptoms that appear after periods ranging from 1 day to as long as 2 weeks. Symptoms and factors studied were: hallucinatory-like experiences, perceptual and motor abilities, cognitive abilities, physiological

excretions were not significantly altered in either group under each of the test conditions. The zero-gravity flight of this experiment did not produce significant change in the muscle-metabolism parameters, lactic and pyruvic acids, and lactic dehydrogenase.

A64-25548**ADRENAL FUNCTION DURING BED REST.**

Fred H. Katz (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 35, Sept. 1964, p. 849-851. 12 refs.

Report of measurement of plasma 17-OH-CS levels as well as adrenal secretory rates of aldosterone and cortisol in healthy subjects before and during periods of bed rest. The circadian rhythm of plasma 17-OH-CS was well maintained during bed rest. Aldosterone secretory rate did not change with bed rest; however, following a period out of bed, there was a diminution of aldosterone secretory rate during a subsequent bed-rest period. Inactivity from rest therefore does not appear to change adrenal cortisol production. It is considered that conclusions cannot as yet be drawn concerning aldosterone production.

A64-25549**PHYSICAL DEFECTS OF CIVILIAN PILOTS RELATED TO AIRCRAFT ACCIDENTS.**

Charles R. Harper (Federal Aviation Agency, Office of Aviation Medicine, Aeromedical Standards Div., Accident Investigation Branch, Oklahoma City, Okla.).

Aerospace Medicine, vol. 35, Sept. 1964, p. 851-856. 14 refs.

Comparison of the frequency of existing pathological defects and history of defects in an accident sample of 3182 pilots involved in general aviation accidents during 1963, to the observed frequency of these same defects in the total pilot population. The comparisons are largely pathology groups: eye, cardiovascular, and orthopedic defects. However, specific comparisons are made concerning defective distant visual acuity, contact-lens wearers, and age. Fatality rates are evaluated for pilots with multiple pathologies. The overall frequency of pathology found in pilots involved in accidents is a significant 2.7 times greater than that frequency in the overall pilot population. Significantly greater frequencies are also found for every pathology group in the accident sample except pilots with corrected defective distant visual acuity, corrected by spectacles or contact lenses; these pilots are represented less in the accident sample than in the total pilot population. As a pilot ages he is represented more often in the accident sample. As age and pathology/pilot increase, the fatality rate increases. It is concluded that to enable more general aviation pilots to fly safely, existing standards must be modified in areas where they appear too restrictive and also in areas where safety is being compromised.

A64-25550**MECHANISMS OF IN VIVO HEMOLYSIS INDUCED BY HYPEROXIA.**

Charles E. Mengel, Herbert E. Kann, Jr., Alvin M. Lewis, and Betty Horton (Duke University, Dept. of Medicine, Durham, N.C.). (Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 857-860. 26 refs.

U.S. Public Health Service Hematology Training Grant No. CRTY-5042.

Extension of previous work, which implicated lipid peroxidation in hyperoxic hemolysis in mice. Current studies in humans demonstrate the probability that lipid peroxidation may account for lysis of erythrocytes in susceptible humans. Additional data supported the concept that the formed lipid peroxides may inhibit other metabolic systems, particularly glycolysis. The significance of these observations and their relationships to other manifestations of oxygen toxicity are discussed.

A64-25551**PATHOLOGY AND PHYSIOLOGY OF GUINEA PIGS UNDER SELECTED CONDITIONS OF IMPACT AND SUPPORT-RESTRAINT.**

C. F. Lombard, S. Davis Bronson, F. C. Thiede, Perry Close, and F. M. Larmie (Northrop Corp., Northrop Space Laboratories, Biodynamics Laboratory, Hawthorne, Calif.).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 860-866. 6 refs.

Study of the use of guinea pigs to examine the problem of human tolerance to and survival under impact conditions. Guinea pigs oriented transversely to the forcing function ($\pm G_x$ and $\pm G_y$) and with a fully contoured rigid support-restraint system survived exposure to 240 G for 3 millisec at 100,000 G/sec onset. Recoverable pulmonary hemorrhage and shock were incurred. Some minor laceration of liver and spleen was infrequently observed, but this is apparently recoverable. However, if the head of the animal was not properly restrained, fatal injury resulted from (1) stretching of brain stem with no head restraint, (2) compression of brain stem with improper head restraint permitting rotation of head on cervical spine at the atlanto-occipital joint, and (3) cerebral hemorrhage when head restraint was loose, permitting rebound of head against the rigid support. Without contoured support (flat) laceration of abdominal viscera was severe in the $+G_x$ orientation. Guinea pigs oriented headward or tailward ($\pm G_z$) to the forcing function at the 240-G level did not survive the severe visceral lacerations, although the pathology incurred indicates that the headward acceleration ($+G_z$) could be survived at a higher level than the tailward ($-G_z$) acceleration if the displacement of the abdominal viscera is minimized by proper containment.

A64-25552**USAF ROCKET EJECTION EXPERIENCE.**

Samuel P. Chun and Robert H. Shannon (USAF, Directorate of Aerospace Safety, Life Sciences Group, Norton AFB, Calif.). (Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 866-870.

Review and discussion of ejection methods and evaluation of results. A trend has been established whereby rocket-assisted ejections will ultimately supplant ballistic ejections. The advantage of the sustained thrust provided by the rocket is that it gets the individual further from the airframe. Ten tables are presented, dealing with various factors affecting successful and unsuccessful rocket ejections. Among subjects covered are injuries received, altitude of ejection, causes of fatalities and major injuries, system malfunctions, and causes of the accidents which compelled ejection. It is noted that although ejections are increasing, there is a general reduction in the overall success of ejections, whether ballistic or rocket assisted. It is considered that, to effect improvement, slow parachute deployment must be eliminated, means of seat separation must be improved, crew members must be trained not to postpone ejection, and system complexity must be reduced.

A64-25554**THE IMPORTANCE OF THE OTOLITHS IN DISORIENTATION.**

W. H. Johnson (Defence Research Medical Laboratories, Toronto, Canada).

(Aerospace Medical Association, Annual Meeting, 32nd, Chicago, Ill., Apr. 24-27, 1961.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 874-877. 12 refs.

Description of a laboratory procedure in which human subjects are exposed to "orbiting without rotation," which is a linear acceleration that is continuously changing direction clockwise or counterclockwise. The device consists of a main turntable upon which is mounted a counter-rotating "secondary" turntable. For each revolution made by the main table, the secondary table makes one revolution in the opposite direction, so that a subject seated on the secondary turntable is carried along a circular path around the center of the main turntable but always faces in the same direction. Evidence is presented and discussed which suggests that "orbiting without rotation" causes an otolithic stimulus which produces measurable effects. It is considered possible that the stimulation of these organs, particularly during and subsequent to weightlessness and during changes in linear acceleration, and its effects, could be of importance in flight.

A64-25555**FLASHBLINDNESS - A PROBLEM OF ADAPTATION.**

J. H. Hill and Gloria T. Chisum (U.S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Johnsville, Pa.).

Aerospace Medicine, vol. 35, Sept. 1964, p. 877-879. 10 refs.

Discussion of the temporary reduction in visual sensitivity due to exposure to a high-intensity flash, which is a potential problem to pilots of modern high-performance aircraft. A brief description of the visual processes affected is given. The relation of light

changes, tolerance of prolonged deprivation, and variables influencing deprivation results. Theoretical accounts of how reduced environmental stimulation exerts its effects range from psychoanalytically orientated interpretations and theories of a psychological nature to neurophysiological theories. The latter are thought to be the most promising, but an adequate theory of stimulus deprivation is still reportedly being sought.

A64-25479**THE EFFECT OF TRUE AND FALSE KNOWLEDGE OF RESULTS ON THE DETECTABILITY OF SIGNALS IN A VIGILANCE TASK.**

Jane F. Mackworth (Defence Research Medical Laboratories, Toronto, Canada).

Canadian Journal of Psychology, vol. 18, no. 2, 1964, p. 106-117. 14 refs.

Comparison of the results produced by the knowledge of results (KR), false knowledge of results (FKR), and no knowledge of results (NK) on the detection of a brief pause in the movement of a clock hand. Seven groups of about 14 subjects were employed. The effect of telling subjects that they had missed a signal was tested during the run and in later NK runs. The percentages of signals detected and of false alarms were measured, and d' estimated. The results were similar for both % detected and d'. The best performance and least decrement were found with KR. With FKR the overall level was intermediate, but the rate of decrement was the same as with NK. Performance with NK was improved following KR, and slightly improved following FKR. It is suggested that the subjects simultaneously learn both the temporal pattern and the characteristics of the signal.

A64-25542**FIELD EVALUATION OF FULL PRESSURE SUITS IN ARCTIC ENVIRONMENTS.**

James H. Veghte (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 819-823.

Report of an evaluation conducted by personnel of the Arctic Aeromedical Laboratory during the past two winters near Fairbanks, Alaska. Thermal responses of six subjects wearing full pressure suits were monitored for several days under Arctic field conditions. In laboratory experiments, heat loss from clothed subjects was measured with an IR radiometer, and moisture accumulation within the clothing was determined during exercise. In temperatures of -16°F, five of the six subjects with no survival equipment reached tolerance limits (skin temperature of 35°F) before 15 hr had elapsed. Termination of the experiment was always because of foot temperatures. Heat loss for these subjects varied from 0.6 to 20.6 kcal/m² hr. With survival equipment, subjects tolerated ambient temperatures that varied from -24° to +25°F for 72 hr. Radiometric thermograms of the pressure garments indicated gloves, zippers, and face were high heat-loss areas. Over 600 g of sweat were retained in closed pressure suits during mild exercise at -10°F. When the suit was partially opened, there was a significant reduction of this retained moisture. It is considered that these data show the critical need for extremity protection, shelter, and ventilation of the pressure garments in dry, cold environments.

A64-25543**THE HEMATOLOGIC EFFECTS OF MICROWAVE EXPOSURE.**

S. M. Michaelson, R. A. E. Thompson, M. Y. El Tamam, H. S. Seth, and J. W. Howland (Rochester, University, School of Medicine and Dentistry, Dept. of Radiation Biology, Rochester, N.Y.). Aerospace Medicine, vol. 35, Sept. 1964, p. 824-829. 12 refs.

Contract No. AF 30(002)-1813.

Presentation of observations providing information on the hematologic changes in the dog induced by microwave exposure. Systematic studies have been made on rodents, but rarely on dogs, although the latter have a hematologic system much more comparable to man's. Whole body exposure of normal dogs to microwaves results in leukocyte changes which can be related to frequency, field intensity, and duration of exposure. A marked decrease in lymphocytes and eosinophils occurs after 6 hr of 100-mw/cm² 2800-Mc pulsed microwave exposure with a mean rectal temperature increase

of 1.8°F. Neutrophils are slightly increased at 24 hours, while eosinophils and lymphocytes have returned to normal levels at this time. After 2 hr of exposure to 165 mw/cm² with a resultant 3°F rise in rectal temperature, there is a slight decrease of all white cells and a definite hemoconcentration. Eosinopenia is still evident 24 hr after exposure. Hematologic changes are more marked after 3-hr exposure to 165 mw/cm². The Cr⁵¹ and Fe⁵⁹ studies indicate alteration of red blood cell life span and bone-marrow function at these exposure levels. General leukocytic changes are more apparent after 1280-Mc pulsed and 200-Mc continuous microwave exposure. Simultaneous X-irradiation and microwave exposure result in accelerated recovery of the ionizing radiation-induced neutropenia and prolongation of the lymphocytopenia. The results of these studies are indicative of hypothalamic and/or adrenal stimulation (stress effect) of microwave exposure and the biologic interaction of microwave and ionizing radiation energies. Alterations in ferrokinetics which are related to duration of exposure indicate effect of microwaves on the bone marrow.

A64-25545**HEARING SENSATIONS IN ELECTRIC FIELDS.**

H. C. Sommer and H. E. von Gierke (USAF, Systems Command, Biodynamics and Bionics Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 834-839. 20 refs.

Discussion of experiments designed to study the hearing phenomena in electrostatic fields when the whole head or parts of its surface are exposed to an alternating electrostatic field of AF with and without a superimposed dc field. The threshold data obtained suggest that there is no other auditory stimulation excepting mechanical tissue excitation by the electrostatic forces connected with such fields. Calculated threshold data for stimulation by AM RF fields, assuming the same electromechanical excitation of normal bone and air conduction hearing, are presented and compared to the hearing phenomena in such fields reported by others. It is considered that electrostatic excitation of vibrations in tissue appears to be a useful new research tool for specialized psychophysiological experimentation on the auditory or vibrotactile system.

A64-25546**OXYGEN TOXICITY AND VITAMIN E.**

Herbert E. Kann, Jr., Charles E. Mengel, Wirt Smith, and Betty Horton (Duke University, Dept. of Medicine, Durham, N.C.).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 840-844. 25 refs.

U.S. Public Health Service Hematology Training Grant No. CRTY-5042.

Report of tests showing that Vitamin E can prevent hemolytic anemia and decrease the incidence of convulsions and mortality in mice exposed to oxygen under high pressure (OHP). Vitamin E has also been demonstrated to decrease lysis and lipid peroxide formation in erythrocytes incubated in vitro with agents known to promote lipid peroxidation. The only known biochemical effect of Vitamin E is inhibition of lipid peroxidation. These findings have supported the hypothesis that excessive lipid peroxidation is responsible for hemolytic anemia and convulsions in mice exposed to OHP.

A64-25547**THE EFFECTS OF CORIOLIS ACCELERATION DURING ZERO-GRAVITY PARABOLIC FLIGHT.**

James K. Colehour (U.S. Navy, School of Aviation Medicine, Pensacola, Fla.).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 844-848. 22 refs.

NASA-sponsored research.

Report of tests on 21 normal and four labyrinthine defective (LD) human subjects who were exposed to repetitive 20-sec intervals of zero gravity or zero gravity plus Coriolis acceleration in parabolic flight. The normal subjects showed significant hematological and biochemical evidence of stress in the form of leukocytic changes and alteration in excretion rates of corticosteroids, while the LD group was virtually free of such changes. Catecholamine

adaptation and dark adaptation of the eye to the changing lighting conditions and the recovery of sensitivity to a functional level are discussed. The suitability of fixed-density goggles as a protective system is examined, and the results of the simulation of protective devices with closing times of 33 and 165 μ sec and 9.8 ms are reviewed. Eye-patch studies are also discussed.

A64-25556

COLLECTION OF BIOLOGICAL INFORMATION DURING PROLONGED FLIGHT MISSIONS WITH "YES AND NO" DATA REDUCTION ANALYSIS.

C. W. Sem-Jacobsen, E. Kaiser, and I. E. Sem-Jacobsen (Gaustad Hospital, EEG-Laboratory, Oslo, Norway).

(Aerospace Medical Association, Annual Meeting, 35th, Miami, Fla., May 11-14, 1964.)

Aerospace Medicine, vol. 35, Sept. 1964, p. 880-883. 5 refs.

Contract No. NAS 2-1235.

Presentation of a method of data reduction, whereby essential data are separated from insignificant random information. In the case of electroencephalograms, as many as 250,000 bits of information may be used to describe a prime tracing, and study of a 24-hr mission, even with the best computers, is a very large task. Here, biological and environmental data are, via transducers, biological amplifiers, and other equipment, fed into detector bridges, which give positive and negative output tensions according to the input signals and the criteria set. Methods are described by which this data can be reduced to a master code, consisting of four "yes or no" answers, giving the neuropsychological, physiological, and psychological status of a pilot, as well as the conditions of the environment, five times/sec, so that only 20 bits/sec need be scanned to find the valuable parts of the primary data.

A64-25557

SLEEP DEPRIVATION - NEUROLOGICAL AND ELECTRO-ENCEPHALOGRAPHIC EFFECTS.

D. R. Bennett, R. H. Mattson, F. A. Ziter, J. R. Calverley, E. A. Liske, and K. L. Pratt (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB; USAF Hospital, Lackland AFB, Tex.).

Aerospace Medicine, vol. 35, Sept. 1964, p. 888-890.

Presentation of three cases from studies at the School of Aerospace Medicine and Wilford Hall USAF Hospital, which explore the effects of sleep deprivation. In two of the three cases, aircrew personnel had convulsions after extensive periods of sleep deprivation, and in the third case a convolution occurred, after abbreviated sleep, in extremely hot weather conditions. All the cases are considered to suggest the possible value of sleep deprivation as an activating procedure in electroencephalography. Electroencephalograms are presented from the three subjects which became definitely abnormal after controlled sleep deprivation of 28-30 hours. A control investigation of a group of aircrew personnel deprived of sleep for varying periods provided inconclusive results, but it is felt that the three presented cases serve to alert the aeromedical physician to the possible relationship between sleep deprivation and convulsions occurring in otherwise healthy individuals.

A64-25568

PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii (Akademiiia Nauk SSSR, Otdelenie Biologicheskikh Nauk, Moscow, USSR). Moscow, USSR, Izdatel'stvo Nauka, 1964. 490 p. In Russian.

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THE DEVELOPMENT OF A PHYSICOCHEMICAL REUTILIZATION SYSTEM FOR USE UNDER CONDITIONS OF A PROLONGED SPACECRAFT FLIGHT [K VOPROSU O RAZRABOTKE FIZIKO-KHIMICHESKOGO ZVENA UTILIZATSII V USLOVIAKH DLITEL'-NOGO POLETA KOSMICHESKOGO KORABLIA]. B. L. Gol'dshvend, B. G. Gusarov, A. G. Lobanov, Iu. E. Siniak, A. P. Tereshchenko, and S. V. Chizhov, p. 193-197. 14 refs. [See A64-25586 21-16]

CHARACTERISTICS OF SOME ARTIFICIAL SUBSTRATES FOR USE IN A CLOSED ECOLOGICAL SYSTEM [KHARAKTERISTIKA NEKOTORYKH ISKUSSTVENNYKH SUBSTRATOV DLIA ISPOL'ZOVANIYA IKH V ZAMKNUTOI EKOLOGICHESKOI SISTEME]. E. V. Lebedeva, p. 198-203. [See A64-25587 21-16]

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GASEOUS PRODUCTS OF VITAL ACTIVITY RELEASED BY MAN IN A HERMETICALLY SEALED CABIN [GAZOOBRAZNYE PRODUKTY ZHIZNEDEIATEL'NOSTI, VYDELIAEMYE CHELOVEKOM PRI NAKHOZHDENII V GERMETICHESKOJ KAMERE]. G. M. Gorban', I. I. Kondrat'eva, and L. T. Poddubnaia, p. 210-216. 19 refs. [See A64-25589 21-16]

THE PROBLEM OF ARTIFICIAL HIBERNATION IN SPACE BIOLOGY [PROBLEMA ISKUSSTVENNOI GIBERNATSII V KOSMICHESKOI BIOLOGII]. N. N. Timofeev, G. D. Glad, and V. S. Organov, p. 217-225. 25 refs. [See A64-25590 21-16]

INVESTIGATION OF ASTRONAUT EFFICIENCY IN AN EXPERIMENT APPLICABLE TO SPACE FLIGHT PROBLEMS [K VOPROSU ISSLEDUVANIIA RABOTOSPOSOBnosti KOSMONAVTA V EKSPERIMENTE PRIMENITEL'NO K ZADACHAM KOSMICHESKOGO POLETA]. L. I. Kakurin and Iu. N. Tokarev, p. 226-234. 9 refs. [See A64-25591 21-14]

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THE PRESERVATION OF INFORMATION TRANSMISSION HABITS UNDER CONDITIONS OF PROLONGED ISOLATION [O SOKHRANENII NAVYKOV PO PEREDACHE INFORMATSII V USLOVIAKH DLITEL'NOI IZOLIATSII]. A. P. Kuz'minov, V. F. Onishchenko, and M. M. Sil'vestrov, p. 245-249. 11 refs. [See A64-25593 21-14]

THE EFFECT OF STATOKINETIC STIMULI ON SOME FUNCTIONS OF THE ORGANISM [VLIIANIE STATOKINETICHESKIH RAZDRAZHITELEI NA NEKOTORYE FUNKTSII ORGANIZMA]. G. V. Altukhov and V. I. Kopanov, p. 250-268. 23 refs. [See A64-25594 21-14]

THE COMPLEX EFFECT OF VIBRATIONS AND IONIZING RADIATION ON THE VESTIBULAR AND MOTOR-DEFENSIVE REFLEXES [KOMPLEKSNOE DEISTVIE VIBRATSII I IONIZIRUIUSHCHEGO IZLUCHENIIA NA VESTIBULIARNYE I DVIGATEL'NO-OBORONITEL'NYE REFLEKSY]. Z. I. Apanasenko and M. A. Kuznetsova, p. 269-277. 10 refs. [See A64-25595 21-14]

VEGETATIVE REACTIONS DURING THE STIMULATION OF THE VESTIBULAR ANALYZER AND THEIR POSSIBLE ROLE IN THE COMPLEX CONDITIONS OF SPACE FLIGHT [VEGETATIVNYE REAKTSII PRI RAZDRAZHENII VESTIBULIARNOGO ANALIZATORA I IKH VOZMOZHNAYA POL' V OSLOZHnenII USLOVII KOSMICHESKOGO POLETA]. A. V. Lebedinskii, Iu. G. Grigor'ev,

R. M. Liubimova-Gerasimova, and B. I. Poliakov, p. 278-288. 14 refs. [See A64-25596 21-14]

THE EFFECT OF LANDING STRESSES ON ANIMALS IMMERSED IN WATER [VLIIANIE PEREGRUZOK PRIZEMLENIA NA ZHIVOTNYKH, POGRUZHennykh V VODU]. G. P. Mirolubov, p. 289-296. 21 refs. [See A64-25597 21-16]

THE EFFECT OF SINGLY ACTING LOADS ON THE STRUCTURE OF INTERNAL ORGANS OF EXPERIMENTAL ANIMALS [VLIIANIE ODNOKRATNO DEISTVUISHCHIKH PEREGRUZOK NA STRUKTURU VNUTRENNIKH ORGANOV EKSPERIMENTAL'NYKH ZHIVOTNYKH]. V. G. Eliseev, Iu. N. Kopaev, and E. F. Kotovskii, p. 297-305. 6 refs. [See A64-25598 21-16]

INVESTIGATION OF THE BIOELECTRIC ACTIVITY OF SECTIONS OF THE CEREBRAL CORTEX DURING ACCELERATION [IZUCHENIE BIOELEKTRICHESKOI AKTIVNOSTI NEKOTORYKH OTDELOV GOLOVNOGO MOZGA PRI PEREGRUZKAKH]. A. N. Razumeev and P. M. Suvorov, p. 306-317. 15 refs. [See A64-25599 21-14]

THE EFFECT OF PROLONGED TRANSVERSE ACCELERATIONS OF THE FUNCTIONAL STATE OF THE CENTRAL NERVOUS SYSTEM OF ANIMALS [VLIIANIE DLITEL'NYKH POPERECHNYKH PEREGRUZOK NA FUNKTSIONAL'NOE SOSTOIANIE TSENTRAL'NOI NERVNOI SISTEMY ZHIVOTNYKH]. V. E. Belai, P. V. Vasil'ev, and S. P. Kolchin, p. 318-323. 11 refs. [See A64-25600 21-14]

THE IMPORTANCE OF PHYSIOLOGICAL INVESTIGATIONS OF THE PROCESS OF SPEECH FORMATION FOR ESTABLISHING A SYSTEM OF AUTOMATIC SPEECH RECOGNITION [ZNACHENIE FIZIOLOGICHESKIH ISSLEDUVANII RECHEVOGO PROTSESSA DLLA TSELEI POSTROENIA SISTEM AVTOMATICHESKOGO RASPOZNAVANIIA RECHI]. V. A. Kozhevnikov and L. A. Chistovich, p. 324-334. 5 refs. [See A64-25601 21-14]

THE CHARACTERISTICS OF AN ALGAE SUSPENSION AS AN OPTICAL SYSTEM [KHARAKTERISTIKA SUSPENZII VODOROSLI KAK OPTICHESKOI SISTEMY]. S. V. Tagieva, A. B. Brandt, V. S. Korshunova, and I. P. Generozova, p. 335-354. 29 refs. [See A64-25602 21-16]

CHANGES IN THE SENSITIVITY AND RESPONSE OF THE VESTIBULAR ANALYZER CAUSED BY IONIZING RADIATION [IZMENENIE CHUVSTVITEL'NOSTI I REAKTIVNOSTI VESTIBULIARNOGO ANALIZATORA POD VLIIANIEM IONIZIRUIUSHCHEGO IZLUCHENIIA]. A. A. Sveshnikov and A. V. Sevan'kaev, p. 355-365. 9 refs. [See A64-25603 21-14]

REACTIONS OF THE VASCULAR SYSTEM OF THE CRANIOCEREBRAL CAVITY TO LONGITUDINAL GRAVITATIONAL LOADS $\pm g$ [REAKTSII SOSUDISTOI SISTEMY CHEREPNOMOZGOVOI PLOSTI PRI EKVIVALENTNYKH PRODOL'NYKH GRAVITATIONNYKH NAGRUZKAKH $\pm g$]. Iu. E. Moskalenko, O. V. Graunov, O. G. Gazeiko, and I. I. Kas'ian, p. 366-378. 11 refs. [See A64-25604 21-16]

PART IV - METHODICAL WORKS.

APPLICATION OF MATHEMATICAL METHODS IN SPACE MEDICINE [PRIMENENIE MATEMATICHESKIH METODOV V KOSMICHESKOI MEDITSINE]. R. M. Baevskii, V. V. Bogdanov, A. D. Voskresenskii, A. D. Egorov, and N. A. Chekhonadskii, p. 379-388. 6 refs. [See A64-25605 21-16]

SOME PROBLEMS IN THE APPLICATION OF THE THEORY OF RANDOM FUNCTIONS IN SPACE BIOLOGY AND MEDICINE [NEKOTORYE VOPROSY PRIMENENIA TEORII SLUCHAINYKH FUNKTSII V KOSMICHESKOI BILOGII I MEDITSINE]. A. D. Egorov and N. A. Chekhonadskii, p. 389-395. 6 refs. [See A64-25606 21-16]

METHODS OF OXYGEN GENERATION THROUGH ELECTROLYTIC DECOMPOSITION OF WATER UNDER CONDITIONS OF WEIGHTLESSNESS [METODY POLUCHENIA KISLORODA ELETROLITICHESKIM RAZLOZHENIEM VODY V USLOVIAKH NEVESOMOSTI]. B. G. Grishaenkov, L. L. Zablotskii, O. F. Ostapenko, Iu. M. Semenov, and A. G. Fomin, p. 396-400. 11 refs. [See A64-25607 21-16]

THE POSSIBILITY OF THE PHYSICOCHEMICAL SYNTHESIS OF CARBOHYDRATES IN A SPACECRAFT CABIN [O VOZMOZHNOSTI FIZIKO-KHIMICHESKOGO SINTEZA UGLEVODOV V KABINE KOSMICHESKOGO KORABLIA]. Iu. E. Siniak, p. 401-409. 72 refs. [See A64-25608 21-16]

INCREASING THE PHOTOSYNTHETIC PRODUCTIVITY OF A CHLORELLA CULTURE IN BIOLOGICAL AIR-REGENERATION SYSTEMS [K VOPROSU O POVYSHENII FOTOSINTETICHESKOI PRODUKTIVNOSTI KUL'TURY KHLORELLY V USTANOVKAHL Dlia BILOGICHESKOI REGENERATSII VOZDUKHA]. G. I. Meleshko, p. 410-414. 5 refs. [See A64-25609 21-16]

ANALYSIS OF TWO METHODS FOR MEASURING THE INTENSITY OF CHLORELLA PHOTOSYNTHESIS [ANALIZ DVUKH METODOV IZMERENIIA INTENSIVNOSTI FOTOSINTEZA KHLORELLY]. E. A. Ivanov and I. V. Aleksandrova, p. 415-427. [See A64-25610 21-16]

THE REPEATED USE OF CULTURE MEDIA FOR CULTIVATING CHLORELLA PYRENIDOSA [O POVTORNOM PRIMENENII PITAL'NYKH SRED DLIA KUL'TIVIROVANIIA CHLORELLA PYRENIDOSA]. T. B. Galkina, p. 428-431. 5 refs. [See A64-25611 21-16]

MATHEMATICAL ANALYSIS OF THE PROCESS OF MASS CULTIVATION OF CHLORELLA IN BIOLOGICAL CULTIVATORS OF NONSYMMETRIC CONFIGURATION [MATEMATICHESKII ANALIZ PROTSESSA MASSOVOGO KUL'TIVIROVANIIA KHLORELLY V BILOGICHESKIKH KUL'TIVATORAKH NESIMMETRICHNOGO PROFILIA]. I. V. Smirnov, p. 432-448. [See A64-25612 21-16]

AUTOMATIC CONTROL OF AN ALGAE-CULTIVATION REGIME [K VOPROSU AVTOMATICHESKOGO UPRAVLENIIA REZHIMOM KUL'TIVIROVANIIA VODOROSLEI]. E. A. Ivanov and I. V. Aleksandrova, p. 449-459. 6 refs. [See A64-25613 21-16]

THE COMBUSTION OF WASTES FROM THE LIFE ACTIVITIES OF ORGANISMS - FRONT GAS REACTIONS - CONDITIONS FOR THEIR EXISTENCE AND PROPAGATION [K VOPROSU SZHIGANIYA OTKHODOV ZHIZNEDEJATEL'NOSTI ORGANIZMON - FRONTOVYE GASOVYE REAKTSII - USLOVIYA IKH SUSHCHESTVOVANIIA I RASPROSTRANENIIA]. S. N. Shorin and V. M. Dapshis, p. 460-471. 14 refs. [See A64-25614 21-16]

AUTOMATIZATION OF THE CULTIVATION OF ONE-CELL ORGANISMS FOR USE IN A CLOSED BIOLOGICAL SYSTEM [AVTOMATIZATSIIA KUL'TIVIROVANIIA ODNOKLETOCHNYKH DLIA ISPOL'ZOVANIIA IKH V ZAMKNUTOI BILOGICHESKOI SISTEME]. I. I. Gitel'zon, I. A. Terskov, V. A. Batov, O. G. Baklanov, and B. G. Kovrov, p. 472-476. [See A64-25615 21-16]

AN AUTOMATED SYSTEM FOR STUDYING THE DEPENDENCE OF PHOTOSYNTHESIS IN HIGHER PLANTS ON MINERAL NUTRITION [AVTOMATIZIROVANNAIA USTANOVKA DLIA IZUCHENIIA ZAVISIMOSTI FOTOSINTEZA VYSSHikh RASTENII OT MINERAL'-NOGO PITANIIA]. V. G. Chuchkin and V. I. Rozhdestvenskii, p. 477-486. 9 refs. [See A64-25616 21-16]

A64-25569

THE BASIC SCIENTIFIC DIRECTIONS OF SPACE BIOLOGY IN THE CONQUEST OF SPACE [OSNOVNYE NAUCHNYE NAPRAVLENIIA KOSMICHESKOI BILOGII V OSVOENII KOSMICHESKOGO PROSTRANSTVA].

V. I. Iazdovskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BILOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 5-9. In Russian.

General discussion of some of the basic principles of space biology and medicine, emphasizing the difficulties encountered in the solution of these problems and the requirements for a larger staff of scientists of various professions. Special attention is paid to the study of the complex effects of such space-flight factors as acceleration, isolation, temperature fluctuations, and pressure gradients, which cannot be simulated entirely on the Earth. The importance of real space flights for scientific data-acquisition is pointed out.

A64-25570

PHYSICAL CONDITIONS OF A SPACE FLIGHT AND THEIR BIOLOGICAL CHARACTERISTICS [FIZICHESKIE USLOVIYA KOSMICHESKOGO POLETA I IKH BILOGICHESKAIA KHARAKTERISTIKA].

Iu. M. Volynkin and P. P. Saksonov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BILOGII. TOM III]. Edited by N. M. Sisakian and V. I. Iazdovskii. Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 10-22. 29 refs. In Russian.

Discussion of some of the biological effects of physical conditions of a space flight. All of the known physical factors which may affect a living organism including man are divided into three groups: (1) factors characterizing the cosmic space as an outer medium (vacuum, ionizing radiation, sharp differences in temperature, etc.); (2) factors associated with the dynamics of a rocket flight (noise, vibration, acceleration, and weightlessness); and (3) factors characteristic of a prolonged stay in the cabin of a spacecraft (artificial atmosphere, limitation of movement, isolation, and food). In addition, the effects of ionizing radiation, rarefied atmosphere, and weightlessness are considered in some detail.

A64-25571

BIOLOGICAL AND PHYSIOLOGICAL INVESTIGATIONS PERFORMED BY MEANS OF ROCKETS AND ARTIFICIAL EARTH SATELLITES [BILOGICHESKIE I FIZIOLOGICHESKIE ISSLEDOVANIIA PRI POLETAKH NA RAKETAKH I ISKUSSTVENNYKH SPUTNIKAKH ZEMLI].

O. G. Gazenko, V. N. Chernigovskii, and V. I. Iazdovskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BILOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 23-36. 13 refs. In Russian.

Summary of the results of biomedical experiments made with the use of geophysical rockets and manned satellites. In particular, the results of Gagarin's and Titov's flights are described in detail. Some preliminary information obtained during the group space flight of Nikolaevich and Popovich is presented.

A64-25572

BASIC PROBLEMS IN THE STUDY OF WEIGHTLESSNESS [OSNOVNYE VOPROSY IZUCHENIIA NEVESOMOSTI].

V. I. Iazdovskii, I. I. Kas'ian, and V. I. Kopanov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BILOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 37-58. 112 refs. In Russian.

Summary discussion of the results of theoretical and experimental investigations into the state of weightlessness. In particular, sensory, motor, vegetative, and histomorphological variations caused by weightlessness are considered. In addition, the adaptive-compensating capabilities of organisms under conditions of weightlessness are examined, and measures against the adverse effects of weightlessness on the human organism are recommended.

A64-25573

SOME PRINCIPLES FOR THE FORMATION OF AN ARTIFICIAL LIFE-SUPPORTING MEDIUM IN SPACECRAFT CABINS [NEKOTORYE PRINTSIPY FORMIROVANIIA ISKUSSTVENNOI SREDY OBITANIIA V KABINAKH KOSMICHESKIKH KORABLEI].

A. M. Genin.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BILOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 59-65. In Russian.

General discussion of some of the problems encountered in the creation of artificial life-supporting conditions in spacecraft cabins. Techniques employed in the formation of such conditions in the Mercury and Vostok capsules are briefly reviewed. It is argued that in creating prototypes of manned spacecraft a compromise should be made between the requirements for maximum comfort of astronauts and the possibilities provided by modern technology.

A64-25574

THE BASIC PROBLEMS OF ENGINEERING PSYCHOLOGY AND SPACE FLIGHT [OSNOVNYE PROBLEMY INZHENERNOI PSIKHOLOGII KOSMICHESKOGO POLETA].

V. G. Denisov, A. P. Kuz'minov, and V. I. Iazdovskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 66-79. In Russian.

Discussion of some of the problems of space engineering psychology, with particular emphasis on: (1) study of psycho-physiological capacity of man under the space-flight conditions; (2) development of requirements for spacecraft control systems taking into consideration the functional characteristics of the man-operator; and (3) development of means and methods for training astronauts to operate the control systems. It is noted that the automatic control systems should be designed with due regard to the functional characteristics of man.

A64-25575

THE PROBLEMS OF PHYSIOLOGICAL INTERACTION BETWEEN ANALYZERS, WITH APPLICATION TO SPACE FLIGHT [PROBLEMY FIZIOLOGICHESKOGO VZAIMODEISTVIA ANALIZATOROV PRIMENEL'NO K KOSMICHESKIM POLETAM].

V. I. Iazdovskii and M. D. Emel'yanov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 80-88. 37 refs. In Russian.

Critical review of investigations into the physiological interaction of such analyzers as vestibular, visual, and proprioceptive during a prolonged space flight. Various hypotheses explaining the mechanism of vegetative disorders that may occur in astronauts during such a flight are considered. In addition, some recommendations are made concerning further research into the effects of space flight on organisms.

A64-25576

THE PROBLEM OF REUTILIZATION UNDER CONDITIONS OF A PROLONGED SPACE FLIGHT [PROBLEMA UTILIZATSII V USLOVIIAH DLITEL'NOGO KOSMICHESKOGO POLETA].

B. L. Gol'dshvend, B. G. Gusarov, A. G. Lobanov, Iu. E. Siniak, A. P. Tereshchenko, S. V. Chizhov, and V. M. Shilov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 89-103. 30 refs. In Russian.

Discussion of the requirements and possibilities of reutilization in life-support systems during prolonged space flights. The function of reutilization is to remove and process all body waste materials into substances suitable for direct employment in other sections of the life-support systems. Possible methods for developing re-utilization systems, based on biological and physicochemical principles, are considered. Their advantages and drawbacks are indicated.

A64-25577

WATER REGENERATION IN A SPACECRAFT CABIN [REGENERTSIYA VODY V KABINE KOSMICHESKOGO KORABLIA].

Iu. E. Siniak and S. V. Chizhov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 104-112. 19 refs. In Russian.

Discussion of the possibilities of developing effective methods for water regeneration that would meet the requirements for energy and weight - i.e., considerable reduction of the weight of life-support systems. A catalytic method of regeneration from water containing body wastes of humans and animals is singled out as the most suitable of the methods considered. On the basis of sanitary and hygienic tests made by both catalytic and lyophilic methods, it is shown that the quality of water thus obtained meets the conventional requirements of drinking water.

A64-25578

BASIC TRENDS IN THE INVESTIGATION OF THE BIOLOGICAL EFFECT OF SPACE RADIATION AND THE SEARCH FOR PROTECTIVE MEANS AGAINST RADIATION [OSNOVNYE NAPRAVLENIIA I ISSLEDOVANII BIOLOGICHESKOGO DEISTVIA KOSMICHESKOI RADIATSII I IZYSKANII SREDSTV PROTIVOLUCHEVOI ZASHCHITY].

V. V. Antipov, N. N. Dobrov, and P. P. Saksonov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 113-124. 26 refs. In Russian.

Examination of the effects of cosmic radiation, with particular attention to the biophysical effects of high-energy particles. It is shown that orbital flights below the Earth's radiation belts are not hazardous, provided that there are no solar chromospheric outbursts. However, during prolonged space flights along orbits passing through the near-Earth radiation belts, especially in the period of solar flares, space radiation appears to be one of the principal hazards. The relative biological effects of individual components of space radiation are considered, together with methods of physical and pharmaceutico-chemical protection and methods of physical and biological dosimetry.

A64-25579

THE OBJECT AND SPACE ENVIRONMENT OF A SPACECRAFT CABIN [PREDMETNO-PROSTRAVNENNOE OKRUZHENIE KABINY KOSMICHESKOGO KORABLIA].

V. V. Zefel'd.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 125-129. In Russian.

Discussion of the problem of arranging the objects and space in the cabin of a spaceship, which represent an integral part of the crew environment. It is indicated that this environment must contain elements characteristic of the trivial surroundings of astronauts' life on the Earth prior to the flight. This approach makes it possible to stimulate the normalization of the psychic and physical tonus of astronauts through associations and thus to help the organism to resist the injurious action of a monotonous flight rhythm and a sharp decrease of stimuli and impressions.

A64-25580

METHODS AND MEANS FOR MEDICO-BIOLOGICAL INVESTIGATIONS IN SPACE FLIGHT [METODY I SREDSTVA MEDIKO-BIOLOGICHESKIKH ISSLEDOVANII V KOSMICHESKOM POLETE].

I. T. Akulinichev, L. F. Andreev, R. M. Baevskii, A. E. Baikov,

B. G. Builov, O. G. Gazenko, R. G. Griuntal', K. P. Kazykin,

Iu. F. Klimentov, D. G. Maksimov, Iu. G. Merkushkin, A. V.

Monakhov, A. P. Petrov, A. D. Riabchenkov, N. P. Sazonov,

R. I. Utiamyshev, V. R. Freidel', B. G. Khil'kevich, I. S.

Shadrinsev, S. B. Shevandina, N. G. Esaulov, and V. I. Iazdovskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 130-144. 7 refs. In Russian.

Description of methods and equipment especially developed for the use onboard the Soviet satellites Sputnik 2 (1957 Beta 1) and Sputnik 3 (1958 Delta 2) for studying the effect of various factors of space flight on animals and man. General requirements for satellite medical instrumentation are examined. Some of the special features of sensor and electrode designs are outlined. The main electric circuits of all measuring devices used are presented.

A64-25581

SOME METABOLIC INDICES IN ASTRONAUTS [NEKOTORYE POKAZATELI OBMENA VESHCHESTV U LETCHIKOV-KOSMONAVTOV].

T. A. Fedorova, L. T. Tutochkin, M. S. Upenskaia, M. M.

Skurikhina, and E. A. Fedorov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 145-158. 13 refs. In Russian.

Discussion of the results of biochemical investigations of blood and urine of astronauts before and after a space flight. It is shown that during the period of training of astronauts peculiar changes are revealed in the protein composition of blood serum: a small increase in the relative albumin content and a decrease in the content of α_2 , β -, γ -globulins and mucoids. At the same time, urine has showed a decrease in the excretion of Dische-positive substances, a drop in the enzymic activity of acid deoxyribonuclease, an increase in the amount of adrenal hormones free-21-oxy-20-ketocorticosteroids and, in some cases, mucoids. During the period of rest, the content of all these substances in blood and urine usually returned to normal. All the biochemical shifts discovered in the organisms of astronauts prior to and after the flight indicate that some metabolic changes are reversible and are rapidly restored.

A64-25582

HUMAN REACTIONS IN WEIGHTLESSNESS [REAKTSII LIUDEI V NEVESOMOSTI].

L. A. Kitaev-Smyk.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 159-166. In Russian.

Presentation of the results of investigations into reactions occurring in humans during short-duration weightlessness produced in aircraft. It is shown that vegetative and psychic disturbances are the basic reactions occurring under such conditions. It is also noted that, on the basis of illusory sensations occurring in the initial stages of weightlessness, the character of subsequent disturbances can be predicted.

A64-25583

THE EXCITABILITY OF MAN'S VESTIBULAR ANALYZER DURING SHORT PERIODS OF WEIGHTLESSNESS [VOZBUDIMOST' VESTIBULIARNOGO ANALIZATORA CHELOVEKA V USLOVIYAKH KRATKOVREMENNOI NEVESOMOSTI].

E. M. Iuganov and A. I. Gorshkov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 167-175. 8 refs. In Russian.

Experimental investigation of adverse vestibulo-vegetative and vestibulo-sensory reactions of man during short periods of weightlessness produced by an aircraft in parabolic flight. Changes in the character and degree of expression of vestibulo-sensory and vestibulo-motoric responses under these conditions are considered in comparison to the circumstances on the Earth under the influence of galvanic currents, and angle and Coriolis accelerations. A natural decrease in the duration of both postrotary nystagmus and the counter-rotation illusion is determined. Recommendations are made for reducing the excitability of the vestibular analyzer to the action of external stimuli during short periods of weightlessness.

A64-25584

THE VESTIBULAR ANALYZER AND THE ARTIFICIAL WEIGHT OF ANIMALS [VESTIBULIARNYI ANALIZATOR I ISKUSSTVENNAYA VESOMOST' ZHIVOTNYKH].

E. M. Iuganov and D. V. Afanas'ev.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 176-183. In Russian.

Determination, during short periods of weightlessness produced by parabolic aircraft flights, of the minimum artificial gravitational force required to maintain the normal posture and motor activity of intact and labyrinth-ectomized albino rats and mice. It is found that the minimum effective gravitational force is created by an acceleration of 0.3 g for intact animals and by an acceleration of 0.1 g for labyrinth-ectomized animals. It is also shown that the vestibular analyzer determines not the reduction, but the increase in the acceleration required to produce the minimum effective artificial weight of animals.

A64-25585

MICROBIOLOGICAL AND CYTOLOGICAL INVESTIGATIONS IN THE CONQUEST OF SPACE [MIKROBIOLOGICHESKIE I TSITOLOGICHESKIE ISSLEDOVANIA V OSVOENII KOSMICHESKOGO PROSTRANSTVA].

N. N. Zhukov-Verezhnikov, V. I. Iazdovskii, I. N. Maiskii, G. P. Tribulev, A. P. Nekhov, P. P. Saksonov, N. I. Rybakov, V. V. Antipov, N. S. Artem'ev, V. A. Kozlov, B. A. Mishchenko, E. V. Iudin, K. D. Rybakova, and E. D. Aniskin.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauki, 1964, p. 184-192. 13 refs. In Russian.

Discussion of microbiological and cytological investigations conducted to determine the genetic influence of the various space factors, especially radiation, on exposed organisms. Results showing the biological effects of radiation on lysogenic bacteria are presented. The possibility of using these bacteria for selecting radiation protection measures is indicated, and future trends in the development of space microbiology are discussed.

A64-25586

THE DEVELOPMENT OF A PHYSICOCHEMICAL REUTILIZATION SYSTEM FOR USE UNDER CONDITIONS OF A PROLONGED SPACECRAFT FLIGHT [K VOPROSU O RAZRABOTKE FIZIKO-KHIMICHESKOGO ZVENA UTILIZATSII V USLOVIYAKH DLITEL'NOGO POLETA KOSMICHESKOGO KORABLIA].

B. L. Gol'dishvend, B. G. Gusarov, A. G. Lobanov, Iu. E. Siniak, A. P. Tereshchenko, and S. V. Chizhov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 193-197. 14 refs. In Russian.

Discussion of the possibilities of developing a system for the reutilization of body wastes during a prolonged space flight, based on physicochemical methods. Experimental results are presented which show how body wastes can be reused through burning or through the employment of catalytic and chromatographic methods.

A64-25587

CHARACTERISTICS OF SOME ARTIFICIAL SUBSTRATES FOR USE IN A CLOSED ECOLOGICAL SYSTEM [KHARAKTERISTIKA NEKOTORYKH ISKUSSTVENNYKH SUBSTRATOV Dlya ISPOL'ZOVANIYA IKH V ZAMKNUTOI EKOLOGICHESKOI SISTEME].

E. V. Lebedeva.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 198-203. In Russian.

Investigation of the principal physical constants characteristic of such artificial substrates as vermiculite, penoshamote, ceramic, and perlite. On the basis of experiments with plants, the agrophysical characteristics of these substrates are determined. The possibility of using the substrates for higher plants in a closed ecological system is indicated.

A64-25588

TOXIC GASEOUS SUBSTANCES EMITTED BY CHLORELLA [TOKSICHESKIE GAZOOBRAZNYE VESHCHESTVA, VYDELIA-REMYYE KHLORELLOI].

M. M. Korotaev, V. V. Kustov, G. I. Meleshko, L. T. Poddubnaia, and E. Ia. Shepelev.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 204-209. 11 refs. In Russian.

Experimental investigation of the emission of toxic gaseous substances by chlorella algae. It is found that, in the process of cultivation of chlorella, carbon monoxide, nitrogen oxides, and hydrocarbons are released in concentrations exceeding the permissible amounts for the premises considered. A possible mechanism for production of these substances during photosynthesis is considered.

A64-25589

GASEOUS PRODUCTS OF VITAL ACTIVITY RELEASED BY MAN IN A HERMETICALLY SEALED CABIN [GAZOOBRAZNYE PRODUKTY ZHIZNEDEIATEL'NOSTI, VYDELIAEMYE CHELOVEKOM PRI NAKHOZHENII V GERMETICHESKOI KAMERE].
G. M. Gorban', I. I. Kondrat'eva, and L. T. Poddubnaia.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 210-216. 19 refs. In Russian.

Investigation showing that humans located in sealed cabins liberate a number of toxic gaseous products into the surrounding medium. These toxic gases include: ammonium, CO, hydrocarbons, aldehydes, ketones, mercaptanes, hydrogen sulfides, and fatty acids. The necessity is indicated for developing effective air-purifying methods and for establishing admissible limits for the concentration of toxic substances in sealed cabins.

A64-25590

THE PROBLEM OF ARTIFICIAL HIBERNATION IN SPACE BIOLOGY [PROBLEMA ISKUSSTVENNOI GIBERNATSII V KOSMICHESKOI BIOLOGII].
N. N. Timofeev, G. D. Glod, and V. S. Oganov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 217-225. 25 refs. In Russian.

Comparative evaluation of a number of methods of artificial hypothermy, using the results from experiments with dogs and rats. A procedure is developed for keeping these animals in a state of deep hypothermy (up to 24 hrs.), thereby maintaining the natural respiration and blood circulation. In experiments with rats, a state of super deep hypothermy is achieved under the conditions of hypoxo-hypercapnia. It is believed that the employment of artificial hibernation in space studies is quite feasible, and some ways are considered for its practical application.

A64-25591

INVESTIGATION OF ASTRONAUT EFFICIENCY IN AN EXPERIMENT APPLICABLE TO SPACE-FLIGHT PROBLEMS [K VOPROSU ISSLEDOVANIIA RABOTOSPOSOBNOSTI KOSMONAVTA V EKSPERIMENTE PRIMENITEL'NO K ZADACHAM KOSMICHESKOGO POLETA].
L. I. Kakurin and Iu. N. Tokarev.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 226-234. 9 refs. In Russian.

Experimental investigation of the efficiency of man under conditions of space flight in a mock-up of the *Vostok* spaceship in order to determine the speed and accuracy of investigating separate problems in the flight program, to evaluate conditions of work and rest, and to determine the effect of sealing and prolonged stay in a special suit on the efficiency of astronauts. The following methods are used: (1) analysis of Morse-code communications, (2) analysis of psycho-physiological tests, and (3) analysis of reports and logbook notations.

A64-25592

INVESTIGATION OF THE MOTOR RESPONSE SPEED OF MAN UNDER THE CONDITIONS OF ISOLATION, USING A POLYEFFECTOR METHOD [ISSLEDOVANIE SKOROSTI OTVETNOI DVIGATEL'-NOI REAKTSII CHELOVEKA V USLOVIYAKH IZOLIATSII POLYEFEKTORNYM METODOM].
V. I. Miasnikov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 235-244. 35 refs. In Russian.

Experimental investigation of the latent period of motor response of man under the conditions of prolonged solitude and in

various regimes of daily activities. An attempt is also made to determine the effect of the orientation reflex on these indices. It is found that a stay under conditions of solitude with a sharply limited flow of external afference is responsible for changes in the length of the latent period of motor response to a light source. The nature of the dynamics of the latent period is found to depend on the regime of daily activities used in the experiments.

A64-25593

THE PRESERVATION OF INFORMATION TRANSMISSION HABITS UNDER CONDITIONS OF PROLONGED ISOLATION [O SOKHRANENII NAVYKOV PO PEREDACHE INFORMATSII V USLOVIYAKH DLITEL'NOI IZOLIATSII].
A. P. Kuz'minov, V. F. Onishchenko, and M. M. Sil'vestrov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 245-249. 11 refs. In Russian.

Investigation of the effect of prolonged solitude on the performing ability of man and on the stability of a developed habit of transmitting information. It is found that in the first days the habit decreases qualitatively and quantitatively. During the second and third days, the disturbed habit and performing ability are restored, but not entirely. The average number of errors in the case of a well-trained subject is higher when working in the conditions of solitude than under normal circumstances. The character of emotional strain is found to depend more on the individual characteristics of each subject studied.

A64-25594

THE EFFECT OF STATOKINETIC STIMULI ON SOME FUNCTIONS OF THE ORGANISM [VLIJANIE STATOKINETICHESKIKH RAZDRZHITELEI NA NEKOTORYE FUNKTSII ORGANIZMA].
G. V. Altukhov and V. I. Kopanov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 250-268. 23 refs. In Russian.

Investigation of some statokinetic stimuli, such as quick head movements, slow rotation, and Coriolis accelerations, on the human organism. Electrocardiograms, electroencephalograms, skin-galvanic reactions, blood pressure, and respiration rate are taken as indices of the functional state. It is found that, under the prolonged action of statokinetic stimuli, the excitability of higher sections of the central nervous system is decreased, and a delay is developed. The manifestation of these shifts depends greatly on the force of the basic nervous processes and the physical strength of the stimuli. The vegetative shifts and bioelectric changes in the cerebral cortex caused by statokinetic stimuli indicate a development of adaptive processes in the central nervous system.

A64-25595

THE COMPLEX EFFECT OF VIBRATIONS AND IONIZING RADIATION ON THE VESTIBULAR AND MOTOR-DEFENSIVE REFLEXES [IKOMPLEKSNOE DEISTVIE VIBRATSII I IONIZIRUUSHCHEGO IZLUCHENIIA NA VESTIBULARNYYE I DVIGATEL'NO-OBORONITEL'NYE REFLEKSY].
Z. I. Apanasenko and M. A. Kuznetsova.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 269-277. 10 refs. In Russian.

Experimental investigation, using guinea pigs and mice, of the effects of vibrations and ionizing radiation on survival, the function of the vestibular analyzer, and the latent period of the flexor reflex. It is found that both the vibrations and the radiation, individually or in combination, are responsible for significant changes in the reflexes considered.

A64-25596

VEGETATIVE REACTIONS DURING THE STIMULATION OF THE VESTIBULAR ANALYZER AND THEIR POSSIBLE ROLE IN THE COMPLEX CONDITIONS OF SPACE FLIGHT [VEGETATIVNYE REAKTSII PRI RAZDRAZHENII VESTIBULIARNOGO ANALIZATORA I IKH VOZMOZHNAIA POL' V OSLOZHNNENII USLOVII KOSMICHESKOGO POLETA].

A. V. Lebedinskii, Iu. G. Grigor'ev, R. M. Liubimova-Gerasimova, and B. I. Poliakov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 278-288. 14 refs. In Russian.

Investigation of the role of the "time-factor" in the action of stimuli on the vestibulo-vegetative responses, using the method of gradual stimulation of the semicircular canals. A correlation is established between the strength of stimuli and the character of these reflexes. The biological expediency of some responses to the stimulation of the vestibular analyzer is discussed.

A64-25597

THE EFFECT OF LANDING STRESSES ON ANIMALS IMMERSED IN WATER [VLIIANIE PEREGRUZOK PRIZEMLENIA NA ZHVOTNYKH, POGRUZHENDYKH V VODU].

G. P. Miroliubov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 289-296. 21 refs. In Russian.

Experimental investigation of the problem of organism tolerance to the action of impact stresses, using the method of liquid immersion. It is shown that the effect of the hydraulic pressure at the moment of impact can cause changes in the function of cardiovascular and respiratory systems and other disturbances.

A64-25598

THE EFFECT OF SINGLY ACTING LOADS ON THE STRUCTURE OF INTERNAL ORGANS OF EXPERIMENTAL ANIMALS [VLIIANIE ODNOKRATNO DEISTVUIUUSHCHIKH PEREGRUZOK NA STRUKTURU VNUTRENNIKH ORGANOV EKSPERIMENTAL'NYKH ZHIVOTNYKH].

V. G. Eliseev, Iu. N. Kopaev, and E. F. Kotovskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 297-305. 6 refs. In Russian.

Investigation showing that accelerations of 8 and 12 g, which act in the ventro-dorsal direction for 3 and 1 minutes, respectively, cause changes in the internal organs of dogs. The changes are related to the vascular channel and parenchymal elements. However, the most serious changes are found to occur in organs having a great mass and a fine vascular system - i.e., lungs, liver, and kidneys. The changes observed are of reversible character.

A64-25599

INVESTIGATION OF THE BIOELECTRIC ACTIVITY OF SECTIONS OF THE CEREBRAL CORTEX DURING ACCELERATION [IZUCHENIE BIOELEKTRICHESKOI AKTIVNOSTI NEKOTORYKH OTDELOV GOLOVNOGO MOZGA PRI PEREGRUZKAKH].

A. N. Razumeev and P. M. Suvorov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 306-317. 15 refs. In Russian.

Experimental investigation of the problem of correlation between the state of bioelectric activity of some sections of the cerebral cortex and man's tolerance of g-loadings. An attempt is also made to explain the mechanisms responsible for the occurrence of definite phase variations in the character of electroencephalograms. On the basis of the results obtained, it is shown that the character of electroencephalogram variations in the case of positive and transverse g-loadings is mainly quantitative.

A64-25600

THE EFFECT OF PROLONGED TRANSVERSE ACCELERATIONS ON THE FUNCTIONAL STATE OF THE CENTRAL NERVOUS SYSTEM OF ANIMALS [VLIIANIE DLITEL'NYKH POPERECHNYKH PEREGRUZOK NA FUNKSIONAL'NOE SOSTOIANIE TSENTRAL'NOI NERVNOI SISTEMY ZHIVOTNYKH].

V. E. Belai, P. V. Vasil'ev, and S. P. Kolchin.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 318-323. 11 refs. In Russian.

Experimental investigation of the effect of transverse accelerations on the functional interaction of stimulating and inhibitory processes in the cerebral cortex and subcortex, using white mice and rats. It is found that during the prolonged action of transverse accelerations, a change is observed in the functional state of higher sections of the central nervous system. In the case of accelerations of short duration (3 min), both a cortex stimulation and inductive inhibition of subcortex cerebral formations are observed. However, in the case of prolonged (9 min) action of g-loadings, a cortex inhibition and stimulation of the subcortex sections of the central nervous system are observed.

A64-25601

THE IMPORTANCE OF PHYSIOLOGICAL INVESTIGATIONS OF THE PROCESS OF SPEECH FORMATION FOR ESTABLISHING A SYSTEM OF AUTOMATIC SPEECH RECOGNITION [ZNACHENIE FIZIOLOGICHESKIH ISSLEDOVANII RECHEVOGO PROTSESSA DLIA TSELEI POSTROENIIA SISTEM AVTOMATICHESKOGO RASPOZNAVANIIA RECHI].

V. A. Kozhevnikov and L. A. Chistovich.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 324-334. 5 refs. In Russian.

Description of a procedure for the continuous electric recording of a number of indices characteristic for the articulation apparatus. The procedure makes it possible to study the dynamics of articulation motions in speech and to accumulate a significant amount of information. On the basis of the experimental results obtained, it is shown that the process of speech formation is accomplished with a checkout over every element. It is indicated that the transition to a subsequent elementary complex of articulation movements is possible only when information on the completion of the preceding one is received.

A64-25602

THE CHARACTERISTICS OF AN ALGAE SUSPENSION AS AN OPTICAL SYSTEM [KHARAKTERISTIKA SUSPENZII VODOROSLI KAK OPTICHESKOI SISTEMY].

S. V. Tagieva, A. B. Brandt, V. S. Korshunova, and I. P. Generozova.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 335-354. 29 refs. In Russian.

Experimental investigation of the optical properties of suspensions of two strains, *Chlorella pyrenoidosa* P-85 and *Chlorella* sp. K. It is found that light absorption by the suspension of a single strain of *Chlorella* occurs in complete agreement with the Buger-Lambert law, whereby the absorption is basically determined by the concentration of pigment (chlorophyll) in the species considered. However, the absolute absorption of the various strains of *Chlorella* is found to depend strongly on the size of the cells and their microscopic structure.

A64-25603

CHANGES IN THE SENSITIVITY AND RESPONSE OF THE VESTIBULAR ANALYZER CAUSED BY IONIZING RADIATION [IZMENENIE CHUVSTVITEL'NOSTI I REAKTIVNOSTI VESTIBULIARNOGO ANALIZATORA POD VLIIANIEM IONIZIRUUSHCHEGO IZLUCHENIIA].

A64-25604

A. A. Sveshnikov and A. V. Sevan'kaev.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 355-365. 9 refs. In Russian.

Experimental investigation of the effect of ionizing radiation on the function of the vestibular analyzer, using the method of γ -irradiation of rabbits and dogs. The threshold sensitivity and response are determined by means of a rotating device and cupulograms. Data are presented on the conjugate increase in the stimulation caused by the cumulative effects of irradiation, vibration, reduced atmospheric pressure, and noise on a living organism.

A64-25604

REACTIONS OF THE VASCULAR SYSTEM OF THE CRANIOCEREBRAL CAVITY TO LONGITUDINAL GRAVITATIONAL LOADS \pm g [REAKTSII SOSUDISTOI SISTEMY CHEREPNOMOZGOVOI POLOSTI PRI EKVIVALENTYKH PRODOL'NYKH GRAVITATSIONNYKH NAGRУZKAKH \pm g].
Iu. E. Moskalenko, O. V. Graunov, O. G. Gazeiko, and I. I. Kas'ian.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 366-378. 11 refs. In Russian.

Experimental investigation of reactions of the cerebral vascular system to longitudinal g-loadings occurring when the position of the body (animals) is changed from horizontal to vertical. The sensitivity and reaction capability of that section of the blood-circulation system are considered. It is shown that longitudinal g-loadings, applied when the position of the body is changed, are responsible for active reactions of the cerebral vascular system. The sensitivity threshold of this system begins at 0.3 to 0.4 g.

A64-25605

APPLICATION OF MATHEMATICAL METHODS IN SPACE MEDICINE [PRIMENENIE MATEMATICHESKIKH METODOV V KOSMICHESKOI MEDITSINE].
R. M. Baevskii, V. V. Bogdanov, A. D. Voskresenskii, A. D. Egorov, and N. A. Chekhonadskii.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 379-388. 6 refs. In Russian.

Discussion of the use of the mathematical information theory for the solution of a series of problems in space biology and medicine. Some examples of medical information processing by means of algorithms are considered, together with the application of simulation models. The problem of predicting the pulse rate when man is subjected to linear accelerations is also examined.

A64-25606

SOME PROBLEMS IN THE APPLICATION OF THE THEORY OF RANDOM FUNCTIONS IN SPACE BIOLOGY AND MEDICINE [NEKOTORYE VOPROSY PRIMENENIA TEORII SLUCHAINYKH FUNKTSII V KOSMICHESKOI BIOLOGII I MEDITSINE].
A. D. Egorov and N. A. Chekhonadskii.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 389-395. 6 refs. In Russian.

Discussion of the problem of representing the main physiological processes of animals and humans by mathematical random functions. A physiological interpretation of the statistical characteristics of random functions is given.

A64-25607

METHODS OF OXYGEN GENERATION THROUGH ELECTROLYTIC DECOMPOSITION OF WATER UNDER CONDITIONS OF WEIGHTLESSNESS [METODY POLUCHENIIA KISLORODA ELEKTROLITICHESKIM RAZLOZHENIEM VODY V USLOVIYAKH NEVESOMOSTI].

B. G. Grishaenkov, L. L. Zablotskii, O. F. Ostapenko, Iu. M. Semenov, and A. G. Fomin.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 396-400. 11 refs. In Russian.

Brief discussion of electrolytic air-regeneration systems in which substances produced as a result of life activities in a sealed cabin are used. The necessity is indicated of developing electrolytic systems that would operate under conditions of weightlessness and would be based on the use of both their physicochemical characteristics as decomposing components and of materials applied in the construction of electrodes and diaphragms.

A64-25608

THE POSSIBILITY OF THE PHYSICOCHEMICAL SYNTHESIS OF CARBOHYDRATES IN A SPACECRAFT CABIN [O VOZMOZHNOSTI FIZIKO-KHIMICHESKOGO SINTEZA UGLEVODOV V KABINE KOSMICHESKOGO KORABLIA].

Iu. E. Siniak.
N: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 401-409. 72 refs. In Russian.

Discussion of some of the problems associated with the synthesis of carbohydrates whose initial products are carbon dioxide, hydrogen, and water. It is indicated that the best way to synthesize the carbohydrates is through the use of Butlerow's formaldehyde polymerization reaction. One of the possible methods of carbohydrate synthesis under conditions of space flight involves the hydration of CO₂ to methane, and the oxidation of methane to formaldehyde with subsequent polymerization to monosaccharides. Formaldehyde can be obtained via methanol formation.

A64-25609

INCREASING THE PHOTOSYNTHETIC PRODUCTIVITY OF A CHLORELLA CULTURE IN BIOLOGICAL AIR-REGENERATION SYSTEMS [K VOPROSU O POVYSHENII FOTOSINTETICHESKOI PRODUKTIVNOSTI KUL'TURY KHLORELLY V USTANOVKAHH DLIA BIOLOGICHESKOI REGENERATSII VOZDUKHA].

G. I. Meleshko.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 410-414. 5 refs. In Russian.

Investigation of the possibility of increasing the productivity of Chlorella culture by considering the photosynthetic activity of each cell under optimum conditions of cultivation. It is shown that about 246 liters of oxygen can be obtained/suspension/day at the expense of a considerable increase in the density of the culture.

A64-25610

ANALYSIS OF TWO METHODS FOR MEASURING THE INTENSITY OF CHLORELLA PHOTOSYNTHESIS [ANALIZ DVUKH METODOV IZMERENIIA INTENSIVNOSTI FOTOSINTEZA KHLORELLY].

E. A. Ivanov and I. V. Aleksandrova.
IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 415-427. In Russian.

Investigation of a capillary-manometric and a polarographic method for measuring the photosynthesis intensity of Chlorella. It is indicated that the polarographic method is more suitable for developing a photosynthesis indicator for systems of automatic biological air regeneration.

A64-25611

THE REPEATED USE OF CULTURE MEDIA FOR CULTIVATING CHLORELLA PYRENIDOSA [O POTOVORNOM PRIMENENII PITA-TEL'NYKH SRED DLIA KUL'TIVIROVANIIA CHLORELLA PYRENIDOSA].

T. B. Galkina.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].
Edited by N. M. Sisakian and V. I. Iazdovskii.
Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 428-431. 5 refs. In Russian.

Investigation of the effect of a repeated use of culture liquids on Chlorella growth. The stimulating and inhibitory effects of these media are related to an absolute increase in the number of cells/unit volume of medium during the preliminary period of cultivation.

A64-25612

MATHEMATICAL ANALYSIS OF THE PROCESS OF MASS CULTIVATION OF CHLORELLA IN BIOLOGICAL CULTIVATORS OF NONSYMMETRIC CONFIGURATION [MATEMATICHESKII ANALIZ PROTSESSA MASSOVOGO KUL'TIVIROVANIIA KLORELLY V BIOLICHESKIKH KUL'TIVATORAKH NESIMMETRICHNOGO PROFILIA].

I. V. Smirnov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 432-448. In Russian.

Quantitative analysis of the possible deviations in the mass productivity of Chlorella by biological cultivators of the nonsymmetric type from that of cultivators of the symmetric type. It is shown that the nonsymmetric biological cultivators are less productive than symmetric ones. The relationship between the irradiated surface and suspension volume required to provide an adequate gas exchange upon irradiation is established. Coefficients describing a biological cultivator as a gas exchanger are given.

A64-25613

AUTOMATIC CONTROL OF AN ALGAE-CULTIVATION REGIME [K VOPROSU AVTOMATICHESKOGO UPRAVLENIIA REZHIMOM KUL'TIVIROVANIIA VODOROSLEI].

E. A. Ivanov and I. V. Aleksandrova.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 449-459. 6 refs. In Russian.

Analysis of the basic characteristics and structure of an automatically-controlled biological air-regeneration system. Some recommendations are made concerning biological and engineering investigations of the type of culture and automatic control conditions.

A64-25614

THE COMBUSTION OF WASTES FROM THE LIFE ACTIVITIES OF ORGANISMS - FRONT GAS REACTIONS - CONDITIONS FOR THEIR EXISTENCE AND PROPAGATION [K VOPROSU SZHIGANIIA OTKHODOV ZHIZNEDEIATELNOSTI ORGANIZMOV - FRONTOVYE GAZOVYE REAKTSII - USLOVIYA IKH SUSHCHESTVOVANIIA I RASPROSTRANENIIA].

S. N. Shorin and V. M. Dapshis.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 460-471. 14 refs. In Russian.

Description of some characteristics of front gas reactions occurring in combustible mixtures in limited and unlimited space regardless of the effects of gravitation. A formula is derived for determining the lower limit of reactivity, together with an equation describing the distribution rate of the reaction front.

A64-25615

AUTOMATIZATION OF THE CULTIVATION OF ONE-CELL ORGANISMS FOR USE IN A CLOSED BIOLOGICAL SYSTEM [AVTOMATIZATSIIA KUL'TIVIROVANIIA ODNOKLETOKHNYKH DLJA ISPOL'ZOVANIIA IKH V ZAMKNUTOI BIOLICHESKOI SISTEME].

I. I. Gitel'zon, I. A. Terskov, V. A. Batov, O. G. Baklanov, and B. G. Kovrov.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 472-476. In Russian.

Investigation of the problem of the automatically controlled cultivation of one-cell organisms in a closed ecological system. A simulation model is developed for studying the automatic operation of biosynthesis. Transition processes that occur during the growth of cultures are also considered.

A64-25616

AN AUTOMATED SYSTEM FOR STUDYING THE DEPENDENCE OF PHOTOSYNTHESIS IN HIGHER PLANTS ON MINERAL NUTRITION [AVTOMATIZIROVANNAIA USTANOVKA DLJA IZUCHENIIA ZAVISIMOSTI FOTOSINTEZA VYSSHIKH RASTENII OT MINERAL'NOGO PITANIIA].

V. G. Chuchkin and V. I. Rozhdestvenskii.

IN: PROBLEMS OF SPACE BIOLOGY. VOLUME 3 [PROBLEMY KOSMICHESKOI BIOLOGII. TOM III].

Edited by N. M. Sisakian and V. I. Iazdovskii.

Moscow, USSR, Izdatel'stvo Nauka, 1964, p. 477-486. 9 refs. In Russian.

Description of an automated system developed for studying the effects of nutrient solution composition on the photosynthesis in higher plants. It is shown that the concentration of elements in this solution can be controlled in accordance with any given program, using conventional automatic control devices. The photosynthesis is measured by an infrared gas analyzer.

A64-25747

CONTROL MECHANISMS OF THE EYE.

Derek H. Fender.

Scientific American, vol. 211, July 1964, p. 24-33.

Application of the technique of systems analysis to the investigation of human vision, in particular, to the processes whereby the eye fixes on and tracks an object in its field of vision. Here, the eye is considered as a servomechanism, monitoring its own performance, and its structure, components, and feedback control systems are described. An experiment was made, which is described, where a miniature mirror and lamp were attached to a contact lens mounted in the eye of a subject, and with the aid of a simple projection system and a photographic plate, a detailed study was made of the eye's positioning and tracking system. Methods are described, utilizing computers and recording galvanometers, by which the data can be recorded and analyzed. A further experiment, utilizing an optical system that interposes the contact contact-lens mirror between a target and the subject's eye, makes possible more complex analyses, which are extensively discussed. It is considered that any information that systems analysis can provide about retinal function should advance the task of understanding how the brain functions.

A64-25786

IONIZING RADIATION AND THE SST.

Stanley R. Mohler (Federal Aviation Agency, Aeromedical Service, Civil Aeromedical Research Institute, Oklahoma City, Okla.).

Astronautics and Aeronautics, vol. 2, Sept. 1964, p. 60-64, 67, 68. 25 refs.

Description of various types of radiation which constitute operational problems, with discussion of preventive measures. Ionizing radiation is a prime constituent of the environment to be traversed by the SST, and comprises galactic and solar cosmic rays. The latter are greatly augmented at the times of solar flares. Such radiation is known to produce events in living tissue that are, from the statistical standpoint, cumulative. Isolated sublethal radiation "insults" can lead to abnormal cell function. Comment is made that all living things have lived with ionizing radiation since their inception. Shielding of an SST is considered to be difficult, and it is shown how limited shielding can increase secondary radiation. It is considered that biochemical substances could be developed that would alleviate or eliminate certain adverse effects, and that suitable scheduling can reduce the degree of exposure to crew and passengers. Glossaries of ionizing radiation terminology, and ionizing radiation measurement and radiobiological terminology are presented.

A64-25825

PERCEPTION OF PATTERN AND COLOUR IN THE STABILIZED RETINAL IMAGE.

G. W. Beeler, D. H. Fender, P. S. Nobel (California Institute of Technology, Pasadena, Calif.), and C. R. Evans (Reading, University, Dept. of Physics, Reading, Berks., England).
Nature, vol. 203, Sept. 12, 1964, p. 1200. 5 refs.

Report of experiment using Ishihara color-blindness test plates as targets for stabilized retinal images. Previous reports of observations of colored areas using such an image indicated a gradual desaturation of colors or of color fusion if bipartite colored fields are used. When black and white geometric shapes were examined, it has been reported, a marked loss of contrast occurred, with ultimate failure of perception over parts or the whole of the visual field. The examination of targets in which color gradations and major pattern variations occur simultaneously had not, however, been reported, and it was for this purpose that the experiment was undertaken. The results of the experiment indicate that hue discrimination and form perception are mediated by separate mechanisms, because in these tests the two types of perception fail independently. Disappearance of the form of the background circles on the Ishihara plates was never observed to occur before color desaturation had taken place, however.

A64-25826

AN AUDITORY ILLUSION OF DISTANCE.

R. A. Butler and R. F. Naunton (Chicago, University, Dept. of Surgery, Chicago, Ill.).
Nature, vol. 203, Sept. 12, 1964, p. 1201.
National Institutes of Health Contracts No. NB 04508-01; No. NB 03815-03.

Report of work examining such an illusion. Previously described experiments indicated that, when a listener used two headphones, receiving the same signal as that emitted by a nearby loudspeaker, the apparent distance of the sound from the listener could be controlled by changing loudspeaker-to-headphone loudness relations. Here, a listener wearing headphones faced a loudspeaker 320 cm away at the end of a cloth-covered arc, and four red lights were spaced irregularly along the arc. Ten-msec bursts of bandpass filtered noise were delivered at a repetition rate of 6/sec to both loudspeaker and headphones. The headphone stimulus was delayed electronically so that the speaker and headphone pulses would reach the listener simultaneously. It was possible for the listener to adjust an attenuator controlling the headphone stimulus until the perceived auditory image was coincident with a previously specified light. In various types of listening situations described, the two auditory inputs, each acting alone, produce an auditory image. One is externalized while the other appears to be in the head. When the two inputs are presented simultaneously, only a single image is perceived. The results suggest that the apparent location of this fused image is determined by the relative dominance of the two separate images.

A64-25994

LIVING NEURO-ELECTRONIC SYSTEMS.

Peter M. Kelly (Philco Corp., Advanced Technology Laboratory, Blue Bell, Pa.).

Space/Aeronautics, vol. 42, Sept. 1964, p. 52-59. 8 refs.

Discussion of the possibilities of utilizing living neural networks to build better target recognition into guidance systems. Ultimate requirements for this service may exceed the practical limits of electronics, so that future missiles, and possibly some computers, may employ an animal brain. Animal instincts are examined, with reference to making use of certain desirable instincts and "training out" less desirable ones. Problems of tying onto biological signals coming out of or going into an animal brain are discussed. It is expected that the technology of learning and development of learning theory can play a significant role in the overall research effort on self-organizing systems, bionic or otherwise. Learning processes are examined in some detail. It is concluded that today machines can only be built that will discriminate between one image and another and, in developing learning machines further, answers may be found both in electronics and bionics.

Elliot S. Valenstein and Thelma Valenstein (Fels Research Institute, Yellow Springs, Ohio).

Science, vol. 145, Sept. 25, 1964, p. 1456-1458. 13 refs.

Grant No. NSG-437; NIH Grants No. M-4529; No. MH-4947.

Presentation of evidence which is said to indicate that the repetitive turning on and off of reinforcing brain stimulation is not a special property of restricted hypothalamic and tegmental areas. Results from a sample of 22 diverse hypothalamic, septal, amygdala, and hippocampal sites reportedly suggest that such behavior can be obtained from most neural areas from which self-stimulation behavior may be elicited. Questions thus arise about the location of aversive neural systems when aversion is considered as being expressed by the act of terminating positively reinforcing brain stimulation.

A64-26014

GRAVITATIONAL STRESS - CHANGES IN CORTICAL EXCITABILITY.

Anthony N. Nicholson (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).

Science, vol. 145, Sept. 25, 1964, p. 1458, 1459. 7 refs.

Report of centrifuge experiments involving five cats which were prepared with permanently implanted extradural electrodes. The study reportedly revealed that evoked responses, recorded from the visual cortex, are enhanced during positive (head to tail) acceleration, and during cerebral hypotension induced by hemorrhage. The phenomenon observed during positive acceleration may therefore be due, at least in part, to its hypotensive effect, but the increased somatic stimulation must also be considered. Histograms of the amplitudes of the positive wave and the median wave forms are given and a drawing is included showing placement of bipolar electrodes.

A64-26013

INTERACTION OF POSITIVE AND NEGATIVE REINFORCING NEURAL SYSTEMS.

LC ENTRIES

A64-80929

THE EFFECT OF RAPIDLY INCREASING ACCELERATIONS ON THE ELECTROCARDIOGRAPHIC CURVE [WPKYW SZYBKIM NARASTAJACYM PRZYSPIESZENIU NA KRZYWA ELEKTROKARDIOGRAFICZNA].
Zbigniew Kajeta (Wojskowy Inst. Med. Lotniczej, Warsaw, Poland).
Acta Physiologica Polonica, vol. 14, Sep.-Oct. 1963, p. 485-491. 11 refs.

In Polish.

Rapid acceleration applied to pilots without previous training was reflected in a hypersympathetic character of the electrocardiogram (ECG). In a group of pilots ejected from a catapult at 13 g for 0.1 second, the heart rate increased by 12 to 45 beats per minute. The T wave was flattened, or even negative. The P wave amplitude and the PQ complex interval were decreased. However, after a period of training on the catapult, an acceleration episode produced no deviation from the normal ECG tracings.

A64-80930

ON PHYSIOLOGICAL AND PATHOGENIC ASPECTS OF FATIGUE [O FIZJOLOGICZNYCH I PATOGENICZNYCH ASPEKTAZH ZMĘCZENIA].
Wl. Misiuso (Inst. Naukowy Kultury Fizycznej, Warsaw, Poland).
Wychowanie fizyczne i sport, vol. 8, 1964, p. 75-89. In Polish.

Three basic types of fatigue are identified: (1) acute, (2) subacute, and (3) chronic. They produce different effects in different individuals. Fatigue may result from physiological exhaustion or psychogenic causes. The effect of the former may be superimposed by emotional stress. The importance of adequate rest accomplished in various ways as the final solution of the problem is stressed.

A64-80931

SOLAR ACTIVITY FACTORS: THEIR EFFECTS ON THE ORGANISM [I FATTORI DELL'ATTIVITÀ SOLARE: INFUENZA SULL'ORGANISMO].
N. Schulte (Hematological Society, Sotki, USSR).

(Xth Health Congress: Heredity, Environment, Nutrition, Ferrara, Italy,

May 23-24, 1964.)

Minerva Medica, vol. 55, May 12, 1964, p. 1501-1502.

A principal factor of solar activity affecting the organism derives from chromospheric eruptions accompanying emissions of cosmic rays, especially protons. Weak eruptions do not produce solar corpuscular streams and have no effect on the organism. The most significant eruptions that affect the Earth arise from large sunspots surrounded by solar flares. Its electromagnetic character can deviate the solar stream from its primary direction. A similar deviation can be caused by a chromospheric eruption accompanying a ray emission. High rays traverse the solar atmosphere, the others act in conjunction with rays of the terrestrial atmosphere and form streams of cosmic rays composed principally of mesons and neutrons. They reach the surface of the Earth but have no relation to primary cosmic rays. The following factors that pertain to solar activity and that affect the organism are known: the sun-spots, their surface, the magnetic characteristics and the photospheric indices of solar flare surfaces, the index of lines coronale $\Delta 6374 \text{ Å}$, the increased activity of the M-region, and the corpuscular streams. It is postulated that during the Earth's history a period of intense irradiation existed that produced biological changes in life on Earth.

A64-80932

EFFECT OF ADRENALECTOMY IN ALBINO RATS ADAPTED TO HYPOXIA ON RESISTANCE TO RADIAL ACCELERATION [VPLIV ADRENALEKTOMII U ADAPTOVANIKH DO GIPOKSII BILIKH SHCHURIV NA REZISTENTNIST' DO RADIALNOGO PRISKORENNIA].

V. P. Dudarev (O. O. Bogomol'tsia Akad. nauk, Inst. Fiziol., Kiev, USSR).
Fiziologichniy Zhurnal, vol. 10, 1964, p. 274-277. 13 refs. In Ukrainian.

Albino rats were adapted to hypoxic conditions by a gradual ascent to an altitude of 3,900 m. On the fifteenth day the animals were bilaterally adrenalectomized. After the operation, they were subjected to a dorso-ventral radial acceleration of 45.3 g for 4 minutes. The results showed that their ability to withstand the acceleration stress was not affected by the adrenalectomy. On the contrary, the animals tolerated the stress better than the normal controls. Adrenalectomy also prevented development of anemia at high altitudes and caused considerable eosinophilia. However, the acceleration suppressed respiration, which became irregular after the first few minutes in the centrifuge, perhaps, due to oxygen deficiency of the respiratory centers of the brain. Further exposure resulted in asphyxia and death.

A64-80933

TWO TYPES OF ADAPTATION TO AN OPTICALLY-ROTATED VISUAL FIELD.

Harutune Mikaelian and Richard Held (Brandeis U., Waltham, Mass.).
American Journal of Psychology, vol. 77, Jun. 1964, p. 257-263. 7 refs.

Nat. Inst. of Mental Health and Nat. Sci. Found. supported res.

The aftereffects of viewing two different environments through a set of prisms that rotated the retinal image by 20° were investigated. In Experiment I, the environment was a long hallway. Large changes in the settings of a line to the vertical and equivalent shifts in the egocentric localization of two separate points were found to be contingent upon active movement of the subject while viewing the environment through the prisms (active exposure). Full and exact compensation for the 20° -tilt was reported for some subjects after prolonged exposure. Subjects viewing the same environment through the prisms while being moved over the same path seated in a wheel-chair (passive exposure) showed a small but significant shift in the settings of the line but no shift on the points. In Experiment II, the exposure environment was designed to eliminate all gridlike patterns. Active exposure with the tilting prisms again resulted in both aftereffects of the prism rearrangement. Passive exposure, however, gave no shifts whatsoever. These results clearly differentiate two processes of adaptation.

A64-80934

Spatio-Temporal Relations in the After-Effects of an I-FIGURE ON THE CRITICAL FLICKER-FREQUENCY.

Irwin M. Spigel (Temple U., Philadelphia, Pa.).

American Journal of Psychology, vol. 77, Jun. 1964, p. 264-269. 5 refs.

An experiment was performed to determine whether (a) the events underlying an enhanced critical flicker frequency (CFF) following prefixation of a black inspection-figure (I-figure) were restricted to the area subtended by the flickering light, the surrounding area, or both; and whether (b) the preinspection time and the area of I-figure were reciprocally related in their effects on the direction of change in the post-fixation threshold of fusion. Thirty-six women served as observers. It was determined that duration of preinspection alone was the significant factor underlying the change in CFF, and that a negatively accelerated increment occurred with all I-figures at 4-, 8-, and 16-seconds pre-exposure times. At two seconds of prefixation, decreased CFF was obtained with the three I-figures. Since there was no significant difference between CFF's with the three I-figures, and the 0.5-inch figure subtended the same visual angle as the flickering luminance, it was concluded that events within the area subtended by the latter were critical in the observed CFF changes. Reciprocity of preinspection time and area of the I-figure in their effects on the threshold of fusion failed to emerge in the data.

A64-80935

THE RELATIONSHIP OF ELECTRICAL TO METABOLIC ACTIVITY IN THE OLFACTORY BULBS OF HIBERNATING ANIMALS.

M. B. Shtark (Sci. Res. Inst. of Psychoneuro., Lab. of Electrophysiol., Odessa, USSR).

(Bullieten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Apr. 1963, p. 14-18).*Bulletin of Experimental Biology and Medicine*, vol. 55, Jun. 1964, p. 370-374. 37 refs. Translation.

In hedgehogs, during periods of hibernation, gradual changes in the cell metabolism of the olfactory bulb were noted. Simultaneous changes were observed in the flow of the electrical impulses. During the first 12 to 16 days, as the temperature fell from 37° C to 24° C , regular rises of potential were registered at frequencies of 40 to 60 c.p.s. A histochemical study of the bulb area during this period showed a maximum concentration of RNA and phosphomonoesterase in the olfactory glomeruli and in the glial elements of their capsules, and a low concentration in the mitral cells of neurons with short axons. The least concentration was found in the granular cell layer. The capsule itself showed no changes. After a further fall in temperature, the amplitude of potentials decreased. The frequency began to decrease when the temperature fell below 21° C . At the final stage of torpor, all potential activity ceased, and the metabolic changes were more pronounced in the mitral cells with their recurrent collaterals, and in the short-axon internuncial neurons.

A64-80936

SEX DIFFERENCES AND THE MAS.

John C. Jahnke, Clarke W. Crannell (Miami U., Oxford, Ohio) and Julian O. Morrisette (Behavioral Sci. Lab., Wright-Patterson AFB, Ohio).

Educational and Psychological Measurement, vol. 24, 1964, p. 309-312. 7 refs.

Contract No. AF 33(616)-7132.

The possibility of a sex bias in the Taylor Manifest Anxiety Scale (MAS) was investigated. Fifty anxiety items of the MAS buffered by the 15 items of the L scale of the Minnesota Multiphasic Personality Inventory were administered to 1,180 men and 678 women. Item analysis on responses of 400 subjects drawn from this group led to conclusions that: (1) sex differences in scoring on the 50-item MAS are not attributable to significant sex differentials in scoring on separate items of it, and (2) the consistent sex differences in scores on the MAS suggest caution in its use.

A64-80937

SOME ELECTROENCEPHALOGRAPHIC CRITERIA OF FATIGUE AFTER MENTAL WORK [NEKOTORYE ELEKTROENSEFALOGRAFICHESKIE KRITERII UTOMLENIYA PRI UMSTVENNOM TRUDE].

Kr. Kirilakov (Transport Med. Inst. Sofia, Bulgaria).
Zhurnal Vyshei Nervnoi Deiatel'nosti, vol. 14, May-Jun. 1964, p. 412-416.
 In Russian.

Railroad office personnel whose work requires acute mental concentration, such as dispatchers or telegraph and telephone operators, showed deviations in the electroencephalogram after overtime. The alpha waves disappeared and fast waves, or slow rhythms with superimposed fast waves, were noted. The tracings had an epileptic character of a temporary nature, which disappeared after a period of rest. The author refers to this effect as a heterofunctional phenomenon, which shows a temporary disturbance in the cortical and subcortical region, primarily in the left temporal zone of speech. This could be the result of a disturbance of the analytical-synthetic function of the audio-speech and speech-kinesthetic activity of the cortex analyzers. Possibly, the tension lowers the cortex tonus. However, during the ensuing hyperpnea and recovery of neurons to normal state the synchronizing ability is enhanced. Simultaneously, general functional changes take place in the organism.

A64-80938

ROLE OF PRETEST EXPECTANCY IN VIGILANCE DECREMENT.
 W. P. Colquhoun and A. D. Baddeley (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, England).

Journal of Experimental Psychology, vol. 68, Aug. 1964, p. 156-160. 8 refs.

The influence of signal probability during pretest practice on performance of a visual detection task was investigated using two levels of signal probability, a practice period, and a test session. The subjects practicing with the high signal probability detected significantly more signals than subjects practicing with the low signal probability. The degree of within-session decrement varied with the different combinations of practice and test probabilities, being greatest in the high practice-low test probability case, and least in the low practice-low test probability case. The time of occurrence of first signal in the test session was also found to affect the decrement function. These results support an expectancy theory of vigilance, and cast doubt on the validity of the conclusions drawn from earlier studies which have failed to control signal probability during pretest practice.

A64-80939

OSCILLATORY PROPERTIES OF THE HUMAN BODY.

V. L. Karpmann and G. V. Sadovskaya (Inst. of Normal and Pathol. Physiol., Clin. Physiol. Lab.; and Inst. of Therapeutics, Moscow, USSR).
Bulleten' Eksperimental'noi Biologii i Meditsiny, vol. 55, Jun. 1963, p. 65-69.

Bulletin of Experimental Biology and Medicine, vol. 55, Jun. 1964, p. 649-652. 8 refs. Translation.

The human body can be regarded as an oscillatory system because of the elastic properties of the tissues. If a person is lying on a rough surface of a platform of a high-frequency ballistographic table and a force of brief duration is applied along the long axis of his body, at the moment of impact the body begins to execute free, diminishing oscillatory motions. They can be measured and recorded on a ballistograph. In experiments in which the body was secured to the table, higher values were obtained. The effect can be expressed mathematically to determine oscillation frequency, elasticity coefficient of the underlying tissues, and the logarithmic decrement of motion. Normal values are also proposed for the time of cessation of oscillation, time of return to the point of equilibrium, and oscillation index.

A64-80940

THE NATURE OF THE INCREASE IN SWEATING CAPACITY PRODUCED BY HEAT ACCLIMATIZATION.

R. H. Fox, R. Goldsmith, I. F. G. Hampton, and H. E. Lewis (Nati. Inst. for Med. Res., Div. of Human Physiol., London, England).

Journal of Physiology, vol. 171, Jun. 1964, p. 368-376. 13 refs.

Skin temperature effects on the local sweating response of the arm with and without heat acclimatization of the subject as a whole were studied in 12 men. Three of four groups were heat-acclimatized, and for 2 hours daily for 15 days one arm was immersed in water at 13°, 37°, and 43° C. The remaining group was not heat-acclimatized, but one arm was immersed in water at 43° C for 2 hours daily for 15 days. Each of the first 3 groups was also subjected at different times to hyperthermia of the total body while immersing the arm. In the nonacclimatized subjects, heating of the arm increased the sweating capacity of that arm. In the acclimatized subjects, immersion at 13° prevented the local increase in sweating capacity, at 37° it had no effect, and at 43° it augmented sweating. During hyperthermia total body sweat loss increased 1.5 times, while the sweat rates of the control arms rose four-fold. There was no evidence that arm temperature affected total body sweating during acclimatization. It is concluded that local skin temperature influences the local sweat rate.

A64-80941

RETINAL VASCULAR RESPONSE TO BREATHING INCREASED CARBON DIOXIDE AND OXYGEN CONCENTRATIONS.

Regina Frayser and John B. Hickam (Ind. U., Med. School, Depts. of Physiol. and Med., Indianapolis).

Investigative Ophthalmology, vol. 3, Aug. 1964, p. 427-431. 8 refs.

Nati. Inst. for Neurol. Diseases and Blindness Grant No. NB-04285; and Life Insurance Med. Res. Fund Grant No. HE-06308.

The retina has a high rate of oxygen consumption, and the retinal vessels are known to constrict with increased arterial oxygen tension and dilate when arterial oxygen falls. In 10 subjects, measurement of retinal venous oxygen saturation by a photographic technique showed an increase from 55% ± 8% saturation breathing air to 82% ± 9% breathing 100% O₂. This increase was accompanied by a 12% ± 6% decrease in retinal arterial size and a decrease of 15% ± 3% in venous diameter. This 27% increase in oxygen saturation is significantly greater than the expected maximum increase of 15%. Unlike the cerebral vessels, the retinal vessels showed no significant vasodilation following inhalation of 10% CO₂ to 21% O₂. However, there was a significant increase ($p < .005$) in retinal venous oxygen saturation, suggesting that a flow change had occurred. The inhalation of 10% CO₂ to 90% O₂ significantly reduced the vasoconstrictor effect of oxygen saturation to 88% ± 9% from 82% ± 9% found with O₂ inhalation alone. From the decrease in retinal arteriovenous O₂ difference, it appears that retinal blood flow can alter without changes in vessels which are too small to be measured by the present technique. Carbon dioxide appears to be capable of significantly reducing the vasoconstrictor response to oxygen.

A64-80942

THE CHEMICAL ORIGIN OF LIFE.

Alexander I. Oparin (USSR Acad. of Sci., Bach Inst. of Biochem., Moscow).
 Springfield, Ill., Charles C. Thomas, 1964, ix + 124 p. 170 refs.

Recent advances in many fields of science, supported by the development of precision systems capable of investigating objects on a microscopic and macroscopic scale, substantiate even more strongly the author's theory formulated forty years ago, that the origin of life is of a chemical nature. However, man still does not hold in his hands any direct factual evidence that would enable him to give a more or less accurate date of the origin of life on earth. On the basis of geological findings, it may be stated, however, with confidence that between the origin of the "primordial soup", containing minute particulate matter in a form of large organic and inorganic molecules and the development of most primitive organisms, a very extensive interval of time must have elapsed. The development proceeded through evolution from an elementary structure to more efficient combinations during a span of time when the earth environment was changing from an anoxicogenic to an oxygenic state, which was not shorter or simpler than the path from amoeba to man. Duplicating the process in the laboratory, man may still hope to accomplish the artificial synthesis of life in the near future.

A64-80943

THE PHYSIOLOGY OF DIURNAL RHYTHMS.

Janet E. Harker (Girton Coll., Cambridge, Great Britain).
 Cambridge, Great Britain, University Press, 1964, vii + 114 p. 132 refs.
 \$2.80.

After brief consideration of the history of research in diurnal rhythms and the evolution of terminology, the author presents the properties of rhythms in detail with illustrations. The essential properties of the circadian system appear to be very similar in all plants and animals. The chapter on environmental control of phase-timing covers factors such as light, abrupt and slow changes in intensity of illumination, photofraction, temperature, feeding time, barometric pressure, interactions between factors, and interspecies variation. The operation of these factors on free-running rhythms is discussed together with limits of variation in period length for environmental cycles longer or shorter than 24 hours and environmental cycles which are submultiples of 24 hours. Phase perturbations are induced by normal environmental conditions or abnormal conditions (low temperature, anesthetics, metabolic inhibitors, and X-rays). Physiological processes concerned with diurnal rhythms are discussed in invertebrates and vertebrates. Abnormalities in rhythmical systems cover dysrhythmia and the synchronization of cycles in diseased systems. Atmospheric rhythms are considered under external time signals.

A64-80944

TASTE SENSITIVITY AND FOOD DEPRIVATION, BLOOD SUGAR LEVEL AND COMPOSITION OF MEAL.

Roy Yensen (New South Wales U., School of Appl. Psychol., Sydney, Australia).
 Nature, vol. 203, Jul. 18, 1964, p. 327-328. 10 refs.

Results of investigations of the relationship between time since ingestion of food and taste sensitivity, and that between blood sugar level and taste sensitivity are reviewed. Findings from one study suggest that up to a certain time, taste sensitivity may increase with the duration of food deprivation, but thereafter it decreases, at least up to 21 hours of fasting. No evidence was found of a systematic relationship between blood sugar levels and taste threshold. A comparison of the effects of the carbohydrate-protein-fat (C.P.F.) and the protein-fat (P.F.) breakfasts revealed that blood sugar levels increase following the former and decrease after the latter, as compared with fasting levels. The latter results suggest that the composition of meals influences sensitivity to sweet. The P.F. meal does not raise the sweet threshold as high as the C.P.F. meal, but its elevating influence is still present 3 hours after the ingestion of the meal, by the time the influence of the C.P.F. meal has largely disappeared.

A64-80945

PURINE METABOLISM BY UNICELLULAR ALGAE. II. ADENINE, HYPOXANTHINE, AND XANTHINE DEGRADATION BY CHLORELLA PYRENOIDOSA.

Elizabeth C. B. Ammann and Victoria H. Lynch (Lockheed Missiles and Space Co., Res. Labs., Palo Alto, Calif.)

Biochimica et Biophysica Acta, vol. 87, Jul. 22, 1964, p. 370-379. 24 refs.

Chlorella pyrenoidosa can utilize adenine, hypoxanthine, xanthine, and uric acid as sole sources of nitrogen for growth. All four purines are taken into the cell intact. Uptake is more rapid than utilization, causing the accumulation of large "pools" of free purines within the cells. Uptake rates proceed in the order: Uric acid > xanthine > adenine > hypoxanthine at a pH of 6.6. Intermediates in purine metabolism were identified and the following well-known pathway for the catabolism of purines was demonstrated: adenine to hypoxanthine to xanthine to uric acid to allantoin to end products. The enzymic decomposition of uric acid within the cell is slightly faster than xanthine degradation. The finding that allantoin is an intermediate in purine metabolism but is not utilized by whole cells is discussed. A comparison of algae and yeast purine metabolism is made.

A64-80946

USAF ROCKET EJECTION EXPERIENCE.

Samuel P. Chunn and Robert H. Shannon (Life Sci. Group, Norton AFB, Calif.) *Aerospace Medicine*, vol. 35, Sep. 1964, p. 866-870.

Rocket assisted ejections are increasing in significant numbers. This increase is synonymous with a general reduction in the overall success of ejection (ballistic and rocket) escape. The decline in the success rate is a matter of great concern. The reasons are becoming more and more apparent as the experience level increases. The latter permits something tangible upon which to implement corrective action. Some of the more obvious conclusions at this time are: (1) To realize the full effectiveness of rocket catapults and achieve a zero altitude zero airspeed ejection capability, the slow deployment characteristics of existing personnel parachutes must be eliminated. (2) A requirement exists for an improved means of seat separation. (3) It is highly probable that crewmembers are delaying ejection because of undue confidence in the advertised capabilities of rocket ejection systems. (4) In some cases, system complexity has resulted in a compromise in reliability and the low level capability. (5) Although the success rate is lower, lives are being saved by rocket ejection systems that would not be saved with ballistic systems. These conclusions dictate a need for immediate and continuing escape system refinement and for additional aircrew guidance regarding the use of these systems at all appropriate levels.

A64-80947

SLEEP DEPRIVATION: NEUROLOGICAL AND ELECTROENCEPHALOGRAPHIC EFFECTS.

D. R. Bennett, R. H. Mattson, F. A. Ziter, J. R. Calverley, E. A. Liske, and K. L. Pratt (USAF School of Aerospace Med., Wilford Hall Hosp., Brooks AFB, Tex.)

Aerospace Medicine, vol. 35, Sep. 1964, p. 888-890.

Three cases are reported from an investigation of the neurological and electroencephalographic (EEG) effects of sleep deprivation. The first two cases illustrate a possible relationship between sleep deprivation and major motor convulsions in susceptible individuals. All cases suggest the possible value of sleep deprivation as an activating procedure in electroencephalography. A brief clinical discussion is given of EEG results of a control group of aircrew personnel and recruits following sleep deprivation. The three cases presented serve to alert the aeromedical physicians to the possible relationship between sleep deprivation and convulsions occurring in otherwise healthy individuals.

A64-80948

VESTIBULAR CLINICAL EXAMINATION WITH USE OF ELECTRONYSTAGMOGRAPHY.

Martin Bergstedt (Umea U., Dept. of Otolaryngol., Sweden)

Aerospace Medicine, vol. 35, Sep. 1964, p. 884-887.

Some basic physiology about the equilibrium system is mentioned, and the principles for electronystagmography are described. A procedure for examination of equilibrium with the use of electronystagmography is proposed. The method recommended is the result of ten years experience.

A64-80949

EUSTACHIAN TUBE FUNCTION.

R. R. A. Coles.

Journal of Royal Naval Medical Service, vol. 50, 1964, p. 23-29. 7 refs.

It is essential for a diver, submariner, or pilot to be able to "clear the ears", i.e., to permit ventilation of the middle compartment of the ear by forcing the residual air through the Eustachian tube. Relatively low pressures in the middle ear can occur not only as a result of the external environment, but also by the absorption of air through mucosa of the middle ear. This pressure can be relieved by a deliberate swallowing movement; but if tubular resistance is high or temporarily raised, as in acute coryza, a more persistent pressure may develop. A man can be tested for his ability to relieve the ear pressure by means

of the Valsalva maneuver or Frentzel's modification of it, by having him force air into the Eustachian tube and by observing the rise in pressure. The Taybee decompression method involves swallowing while the subject holds his nose. Auscultation and subjective reaction can supplement the results of these tests. The nasopharyngeal pressure can also be measured by a sphygmomanometer. In all tests, positive results are considered to be reliable, while negative findings are of no diagnostic value.

A64-80950

THE OVERWEIGHT AVIATOR AND DECOMPRESSION SICKNESS.

D. C. McNutt,

Journal of Royal Naval Medical Service, vol. 50, 1964, p. 4-6. 7 refs.

Three aspects in the etiology of decompression sickness (altitude and time, age, and weight) are discussed. A chart of the incidence of decompression sickness related to age in 2,203 naval aviators and a chart demonstrating the increase in body weight in those suffering from chokes are presented. Both age and increased body weight are important contributors to the development of chokes, the most common symptom complex in severe decompression sickness. The medical officer can attack the obesity problem by encouraging the overweight aircrewman to reduce. Little, however, can be done with regard to aging.

A64-80951

ELECTROCARDIOGRAMS OF MARATHON RUNNERS IN 1962 COMMONWEALTH GAMES.

W. G. Smith, K. J. Cullen, and I. O. Thorburn (Sir Charles Gairdner and Royal Perth Hosp., Perth, Western Australia).

British Heart Journal, vol. 26, 1964, p. 469-476. 11 refs.

Resting electrocardiograms of 21 top-class marathon runners were analyzed. Eighteen tracings were obtained soon after the marathon race in the 1962 Commonwealth Games in Perth, Western Australia. The previous reports of bradycardia with high voltage of QRS complexes, T, and U waves were confirmed. In some, but not all, the P and T waves increased in amplitude after the race. A plea is made for a long-term prospective study of such athletes on an international basis in order to assess the significance of the electrocardiogram and other changes.

A64-80952

CHANGES IN ARTERIAL PRESSURE ON THE RETINA DUE TO NOISE STRESS (NETZHAUTARTERIENDRUCK-VERÄNDERUNGEN NACH LARMBELASTUNG).

G. Yannoulis and K. A. Konstas (Thessaloniki U., Augenklinik, Greece).

Acta Oto-Laryngologica, vol. 57, 1964, p. 217-223. 6 refs. In German.

Continuous registration of pressure in the central retinal artery was carried out in 28 subjects under noise stress. In the majority of cases a significant fall in blood pressure of the retinal artery was registered after the fifth minute of exposure to noise at 98 decibels. At the same time pressure in the brachial artery was almost unchanged. The fall of pressure in the central retinal artery is thought to be due to vasodilatation in the area supplied by carotid artery circulation. Since it is known that noise stress leads to vasoconstriction in the skin, it is suggested that the opposing circulatory reactions are partial expressions of the same reflex reactions of the vasomotor center to noise.

A64-80953

ON NYSTAGMUS PROVOKED BY CENTRAL STIMULATION.

L. B. W. Jongkees, W. J. Oosterveld, and S. Zelig (Amsterdam U., Dept. of Wilhelmina Gasthuis, The Netherlands).

Acta Oto-Laryngologica, vol. 57, 1964, p. 313-319. 8 refs.

A study was conducted of the effect of various vestibular influences (alcohol, rotation, calorization, optokinetic stimulation, neck torsion, and parallel swing) on nystagmus provoked by electric stimulation of the nystagmogenic center in the mesodiencephalon which extends from the frontal part of the reticular formation towards the mesencephalic reticular formation and medially to the lateral geniculate body. In some cases the result is pure addition or subtraction of effects (rotation); in others centrally provoked nystagmus is depressed (alcohol) or increased (optokinetic). Cinnarizine does not influence the nystagmus provoked by central stimulation.

A64-80954

DAMAGE OF THE RESPIRATORY MUCOUS MEMBRANE OF RATS EXPOSED TO COLD.

B. Gusić, Z. Krajina, J. Lakic, V. Konic, and I. Babic (Zagreb U., Otorhinolaryngol. Clin. and Pediat. Clin. of the Med. Faculty, Zagreb, Yugoslavia).

Acta Oto-Laryngologica, vol. 57, 1964, p. 342-351.

Thirty-five albino rats were exposed to low temperature between 0° C and -18° C during a period of 7 to 30 days. Bacteriological and histological analyses of the respiratory mucous membrane of the rats were made. There is evidence of definite damage to the nasal mucous membrane of rats after exposure to continuous cold. Exposure to cold for eight hours daily for one month does not result in serious bacteriological or histological changes on the nasal mucous membrane but has stronger repercussions on the mucous membrane of the larynx and trachea.

A64-80955**AUDITORY ADAPTATION.**

Tauno Palva (Turku U., Dept. of Otolaryngol., Oulu, Finland).
Acta Oto-Laryngologica, vol. 57, 1964, p. 207-216. 26 refs.

Peristimulatory auditory adaptation for pure tones can be measured either at suprathreshold levels or at threshold. The results of the former test are associated with many possible sources of error, the most important being adaptation of the control ear during median plane localization matches. It is felt that this test is too cumbersome for clinical work. Adaptation at threshold is easy to measure and excessive adaptation seems mostly to be associated with retrocochlear deafness. Moderate adaptation values can occur in any type of perception deafness. This test should belong to the routine auditory testing methods employed in clinical work.

A64-80956**THE ACTION OF BRONCHIAL MUSCLES.**

V. Negus.

Acta Oto-Laryngologica, vol. 57, 1964, p. 405-409.

Proposals suggesting various functions of the bronchial and bronchiolar muscles are presented and discussed. Muscular contractions can eliminate the lumen of bronchioles and can thereby remove secretions and also dead space air, while at the same time helping in mixing unused air from the anatomical dead space with the partly used up gases in the alveoli.

A64-80957**EXPERIMENTS ON NERVOUS FACTORS CONTROLLING RESPIRATION AND CIRCULATION DURING EXERCISE EMPLOYING BLOCKING OF THE BLOOD FLOW.**

Erling Asmussen and Marius Nielsen (Copenhagen U., Lab. for the Theory of Gymnastics and the Zoophysiol. Lab. A, Denmark).

Acta Physiologica Scandinavica, vol. 80, 1964, p. 103-111. 16 refs.

During uninterrupted work on the bicycle ergometer the blood flow to the legs was suddenly interrupted by means of blood pressure cuffs. In the period with blocked circulation, CO_2 was added to the inspired air in such amounts that the alveolar PCO_2 remained constant. The excess work O_2 -uptake decreased up to 50%. The pulmonary ventilation, pulse rate, and systolic blood pressure showed a steady and considerable increase. The cardiac output remained nearly constant with a tendency to decrease during the blocking period. The $(\text{a}-\bar{\text{v}})\text{O}_2$ difference and the mixed venous PCO_2 consequently decreased considerably. These changes in respiratory and circulatory functions were well reproducible and the scattering of the values only small. It was concluded that the observed changes are neurogenic and caused by the increasing anaerobiosis in the blocked muscles. The nervous impulses involved may be elicited from muscle chemoreceptors, or they may stem from mechanoreceptors being activated through an observed recruitment of new motor units necessitated by the anaerobiosis.

A64-80958**ACCUMULATION OF FLUID IN EXERCISING SKELETAL MUSCLE.**

S. Jacobsson and I. Kjellmer (Göteborg U., Dept. of Physiol.; and Gen Hosp., Dept. of Plastic Surg., Sweden).

Acta Physiologica Scandinavica, vol. 80, 1964, p. 286-292. 14 refs.

Grant No. PHS-G-HE-05675-03; AF-EOAR-61-47; Maggie Stephen's Found. for Med. Res., and Svenska Idrottens vetenskapliga forskningsråd supported research.

Lymph flow from, and volume changes in, muscles during exercise were recorded simultaneously. During exercise there occurs an outward filtration at an initially steady rate. This filtration gradually diminishes and finally ceases. Under the experimental conditions used, lymph flow was very small compared with the rate of outward filtration. The capillary filtrate accumulated in the muscle. The amount of fluid accumulated varied with the workload. The factors limiting outward filtration are discussed. The most important limiting factors seem to be gradually rising tissue pressure and, to some extent, changes in colloid osmotic pressure on either side of the capillary wall.

A64-80959**DEPTH PERCEPTION LOSS WITH LOCAL MONOCULAR SUPPRESSION: A PROBLEM IN THE EXPLANATION OF STEREOPSIS.**

Julian Hochberg (Cornell U., Dept. of Psychol., Ithaca, N.Y.)
Science, vol. 145, Sep. 18, 1964, p. 1334-1335. 9 refs.

Grant No. NSF-G-GB-71.

Contours added to only one eye's view cause both suppression of the other view and loss of perceived depth. Since piecemeal contralateral suppression may be the general rule of binocular combination, the finding that suppressed views do not contribute to stereopsis raises basic questions about the nature of stereoscopic depth perception.

A64-80960**EFFECTS OF PURE OXYGEN INHALATION, ALTITUDE, AND PRESSURE BREATHING ON MAXIMUM BREATH HOLDING TIME.**

Haruo Ikegami (Aeromed. Exptl. Lab., Tokyo, Japan).

Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Jun. 1964, p. 61-68. 11 refs. In Japanese.

Maximum breath holding time (MBHT) was studied in five healthy adults during respiration of air, pure oxygen at ground level and at altitude, and during pressure breathing at altitude. Decreasing alveolar PO_2 and increasing alveolar PCO_2 limit MBHT. Oxygen inhalation at ground level extended MBHT by 35%, possibly as a result of the absence of hypoxic stimulus, lack of sensitization of the respiratory center to CO_2 due to hypoxia, and mild hypocapnia due to increased oxyhemoglobin. MBHT was unchanged at 6,000 m altitude, but was shortened at 10,000 m. The decrease in alveolar PO_2 , the condensation of alveolar CO_2 , the decrease in total lung capacity, and fatigue are considered as factors which shorten MBHT. Pressure breathing with 100% oxygen at an altitude of 10,000 m markedly extended MBHT. Suggested causes for the extension are increase in alveolar PO_2 , lung volume, hyperventilation and other factors such as a reflex mechanism stimulated by increased alveolar pressure.

A64-80961**SOME REACTIONS OF THE CIRCULATORY SYSTEM IN A CONTINUED STATE OF WEIGHTLESSNESS PRODUCED BY THE IMMERSION METHOD [NIEKTÓRE ODCZYNY UKŁADU KRAZENIA W STANIE PRZ EDLUZONEJ NIEWAZKOSCI, UZYSKANEJ METODĄ IMMERSYJNA].**

Julian Walawski and Zbigniew Kaleda (Zakład Patologii Ogólnej i Doswiadczenia AM, Warsaw, Poland).

Acta Physiologica Polonica, vol. 14, 1963, p. 399-403. 9 refs. In Polish.

Rabbits tolerated quite well a state of relative weightlessness, induced by immersion for 24 hours or longer in a tank filled with a 1% NaCl solution at 34° to 35° C. It did not produce any significant effects on the animals' blood circulatory system. Clinical analysis of blood did not disclose any deviation from normal after an 8 to 24 hour period of immersion. The electrocardiogram showed no essential abnormalities. The heart rate was about 230 per minute. The PQ interval was 0.07 second; the QRS complex interval 0.03 second; and the QT interval 0.18 second.

A64-80962**SPINAL MOTOR RESPONSES TO ACOUSTIC STIMULATION.**

Bo E. Gernandt and Harlow W. Ades (U.S. Naval School of Aviation Med., Pensacola, Fla.)

Experimental Neurology, vol. 10, Jul. 1964, p. 52-66. 14 refs.

NASA supported research.

Single auditory click stimulation elicits, in lightly strychninized cats, motor responses appearing along both sides of the spinal cord. In the competition for access to the final common path, the evoked descending acoustic volley of impulses is readily blocked by prior dorsal-root stimulation. Since the ventral root responses recorded contralaterally to the side of auditory stimulation have the same appearance, respond identically to higher frequency stimulation, and interact with dorsal-root responses in an identical way as do the ipsilateral ventral root responses, it is assumed that the acoustic mechanisms on the two sides of the spinal cord are mirror images of each other elicited from a common brainstem neuronal pool. Decerebration and cerebellectomy do not interfere with the transmission of this acoustico-spinal reflex activity. Auditory projections to the brainstem reticular formation are evidently sufficient to maintain the pattern of the descending reflexes. Partial sections of the spinal cord demonstrate that the descending connections necessary for the transmission of auditory induced activity are part of a diffusely projecting spinal system. Bilateral motoneuron discharges following unilateral acoustic stimulation are ensured by an abundance of functional crossings in the brainstem and along the extent of the spinal cord.

A64-80963 **SO_2 ABSORPTION IN THE RESPIRATORY TRACT: STUDIES ON THE ABSORPTION IN RABBIT, ITS DEPENDENCE ON CONCENTRATION AND BREATHING PHASE.**

Lars G. Strandberg (Karolinska Inst., Inst. of Hyg.; and Natl. Inst. of Public Health, Dept. of Gen. Hyg., Stockholm, Sweden).

Archives of Environmental Health, vol. 9, Aug. 1964, p. 160-166. 9 refs.

A method is presented for studying the absorption of gaseous substances in the breath of rabbits. The method permits differentiated sampling at the maximum of inspiration and expiration. The absorption of SO_2 from approximately 700 p.p.m. was studied. The investigation showed that during exposure to low SO_2 concentrations, the relative absorption of the gas in the respiratory tract decreased appreciably. The relative content of SO_2 in the trachea during inspiration increased from approximately 5% to about 60%; the corresponding values during expiration, from approximately 2% to about 20%.

A64-80964**THE EFFECT OF TEMPERATURE ON CYSTEAMINE ACCUMULATION IN CELLS AND ON ITS RADIOPROTECTIVE ACTIVITY [VLIJANIE TEMPERATURY NA NAKOPLENIE TSISTEAMINY V KLETKAH I NA EGO PROTIVOLUCHEVUJU AKTIVNOST'].**

E. IA. Graevskii, M. M. Konstantinova, I. V. Nekrasova, and A. G. Tarasenko (USSR, Acad. of Sci., Inst. of Animal Morphol., Moscow).

Zhurnal obshchei biologii, vol. 25, Jul.-Aug. 1964, p. 298-301. 8 refs.

In Russian.

Cysteamine decreased the degree of radiation damage in a seven-day culture of Ehrlich's ascitic cancer cells at 37°C and 21°C, but produced no noticeable effect at 0°C, though at both temperatures the cells accumulated the compound at the same rate and in the same amount. However, the protective effect was noted even at 0°C if the cells had been exposed to cysteamine action at 37°C prior to irradiation. Therefore, the lack of protective action cannot be attributed to inability of the compound to penetrate into the cell. It is possible that the protective effect of cysteamine is not related to inactivation of radiolysis products but depends upon its direct interaction with cell-protective components.

A64-80965

THE EFFECT OF PRIOR INSTRUCTIONS AND TIME KNOWLEDGE ON THE TOLERATION OF SENSORY ISOLATION.

R. D. Francis (U. Coll., Dept. of Psychol., Wollongong, New South Wales, Australia).

Journal of Nervous and Mental Disease, vol. 139, Aug. 1964, p. 182-185.

The following factors were investigated to determine what effect, if any, they have on the toleration of isolation: (1) prior instructions, (2) time orientation, (3) interaction between numbers 1 and 2, (4) sex differences, and (5) differences between skilled Scuba divers and nondivers. The evidence suggests that prior instructions as to length of stay in isolation, combined with time orientation, affect toleration time significantly. Neither skill in Scuba diving nor sex has a similar influence.

A64-80966

ELECTROMYOGRAPHIC STUDY OF AGING IN SKELETAL MUSCLE.
Karl E. Carlson, Walter Alston, and Daniel J. Feldman (Veterans Admin. Hosp., Phys. Med. and Rehabil. Serv., and Stanford U. School of Med., Div. of Rehabil. Med., Palo Alto, Calif.)

American Journal of Physical Medicine, vol. 43, Aug. 1964, p. 141-145.

10 refs.

Electromyographic studies of skeletal muscles were carried out on 50 aged subjects. Decreased amplitude, high incidence of polyphasic motor unit potentials, and decay in amplitude on sustained contraction were observed. No evidence of denervation (fibrillation potentials) was found. Motor nerve conduction velocities were within normal limits. The significantly increased polyphasic activity suggests a delay in end plate transmission or muscle fiber response. The decreased amplitude is most likely due to a relative decrease in muscle fiber size and number.

A64-80967

SUBJECTIVE EXPECTANCY AND CHOICE REACTION TIMES.

G. H. Mowbray (Johns Hopkins U., Appl. Phys. Lab., Silver Spring, Md.)

Quarterly Journal of Experimental Psychology, vol. 16, Aug. 1964, p. 216-223. 8 refs.

Contract No. CR-NOW-62-0604-c.

Previous findings suggested that selective response times might be affected both by the interstimulus interval and by the probability of occurrence of the stimulus for reaction. These two factors have been tested independently and have been found to influence reaction times in a fashion that an expectancy hypothesis would predict.

A64-80968

VISUAL DISCRIMINATION OF SHAPE BY HUMANS.

J. Butler (Exeter U., Psychol. Lab., Great Britain).

Quarterly Journal of Experimental Psychology, vol. 16, Aug. 1964, p. 272-276.

Visual discrimination of shape was studied by measuring (a) reaction time to tachistoscopic exposure of shapes paired for comparison and (b) sorting times in a card sorting task. The results of both experiments are comparable. The order of difficulty of the following shapes was (1) circle versus triangle (easiest); (2) circle vs. square; (3) square vs. triangle; and (4) triangle vs. diamond (most difficult). The results are compared with those reported for the octopus and rat by N. S. Sutherland, (*Nature*, vol. 179, 1957, p. 11-13; vol. 186, 1960, p. 840-844; *Quarterly Journal of Experimental Psychol.*, vol. 11, 1959, p. 24-32; vol. 14, 1962, p. 140-156). Discrimination in humans is discussed in terms of analysis of horizontal and vertical projections of the shapes proposed by Sutherland in the above experiments.

A64-80969

APPARENT DISTANCE IN A HORIZONTAL PLANE WITH TACTILE-KINES-THETIC STIMULI.

Robert S. Davidson and Mei-Fang Hsieh Cheng (Bryn Mawr Coll., Bryn Mawr, Pa.)

Quarterly Journal of Experimental Psychology, vol. 16, Aug. 1964, p. 277-281. 7 refs.

Grant No. G-AFOSR-61-1.

In the study of active tactile-kinesthetic space perception, apparent distance has been found to vary as a function of the direction of the line segment in a horizontal plane. The present data indicate that the error is not consistently related to the same frame of reference as the visual illusion. Rather, with movement of the extended arm to determine the relative distances between

pairs of points, radial distances are overestimated in relation to tangential ones, whether parallel or perpendicular to the medial plane. Interpretations are in terms of kinesthetic stimulus patterns and the structure of perceptual representation.

A64-80970

THE ACUTE INHALATION TOXICITY OF TETRAFLUOROHYDRAZINE.

Theophilus R. Carson and Frank T. Wilinski (U.S. Army Chem. Res. and Develop. Labs., Toxicol. Div., Edgewood Arsenal, Md.)

Toxicology and Applied Pharmacology, vol. 6, Jul. 1964, p. 447-453. 9 refs.

Rats and dogs were exposed to several concentrations of tetrafluorohydrazine (N_2F_4) below the previously determined rat 15- and 60-minute 50% lethal concentration. No histopathologic changes were observed in animals exposed to lethal and sublethal concentrations of N_2F_4 in the 15- and 60-minute exposures. However, some pathologic changes involving the lungs, spleens, and livers were observed in animals exposed to lethal concentrations in the 4-hour exposures. The toxic signs were cyanosis, hematologic changes, and eye and nasal irritation. Rats showed signs of eye and nasal irritation at concentrations causing no such effects in dogs. However, at these concentrations dogs had a greater increase in methemoglobin than did the rats.

A64-80971

CARDIOVASCULAR HEALTH STATUS, AGE, AND PSYCHOLOGICAL PERFORMANCE.

Walter Spieth (FAA, Georgetown Clin. Res. Inst., Wash., D.C.)

Journal of Gerontology, vol. 19, Jul. 1964, p. 277-284. 17 refs.

Psychological performance tests were given to more than 600 men aged 23-59. All were in nominally normal health. Mild to moderate degrees of cardiovascular disease, with apparent cerebral involvement, were reliably associated with slow and, to a lesser extent, poor performance. It is concluded that this was not an artifact of attitude or testing situation. Because cardiovascular disease is common in old humans and its incidence increases very rapidly after age 35, it is suggested that much of the typical downward trend of performance with age is a reflection of cardiovascular diseases rather than of aging per se.

A64-80972

SET AND AGE IN A CHOICE-RESPONSE TASK.

Patrick M. A. Rabbitt (MRC, Appl. Psychol. Res. Unit, Cambridge, England).

Journal of Gerontology, vol. 19, Jul. 1964, p. 301-306. 7 refs.

Groups of young subjects (mean age 23.1 years) and old subjects (mean age 71 years) were given a four-choice reaction time task in which the signal was preceded by a fore-signal of either of three types of varied partial information on the subsequent signal. Young subjects responded faster when given partial advance information at preparatory intervals of 0.2, 0.5, 1.0, and 1.5 seconds than when fore-signals of these durations were uninformative. Old subjects showed no significant improvement with partial advance information at any fore-signal duration used. When the advance information was false both young and old subjects showed increases in response time relative to the uninformative fore-signal condition, at fore-signal durations of 0.5, 1.0 and 1.5 seconds. The maximum effects of false advance information were apparent for the old group at 1.5 seconds of fore-period duration, and for the young group at 0.5 seconds of fore-period duration.

A64-80973

AGE AND TIME FOR CHOICE BETWEEN STIMULI AND BETWEEN RESPONSES.

Patrick M. A. Rabbitt (MRC, Appl. Psychol. Res. Unit, Cambridge, England).

Journal of Gerontology, vol. 19, Jul. 1964, p. 307-312. 13 refs.

The effects of independent variations in stimulus entropy and response entropy upon the reaction times of old and young subjects were compared by means of a card sorting task. In both two-choice and four-choice situations the response times of old subjects were found to be less affected than those of young subjects by increases in stimulus entropy from one stimulus response to two stimuli response. Increases in stimulus entropy above two stimuli response, however, affected the response times of old subjects more than those of the young. A comparison of the present data with that obtained in previous studies on young subjects makes it improbable that the age differences detected occur because of differences in the amounts of practice required by young and old subjects in order to reach a common level of performance. These data are therefore interpreted as a further illustration of complex age decrements in perceptual discrimination and the analysis of information.

A64-80974

THE EFFECT OF STEADY FIXATION ON THE JUDGEMENT OF RELATIVE DEPTH.

Ian P. Howard and William B. Templeton (Durham U., Great Britain).

Quarterly Journal of Experimental Psychology, vol. 16, Aug. 1964, p. 193-203. 12 refs.

Grant No. G-DSIR-1208/69/1.

Subjects were asked to judge the relative depth of test edges under various conditions of inspection: (1) when the edges were equidistant; (2) when no edges were present; and (3) when one edge was 1, 2, or 4 inches in front of the other. The third condition produced a significant shift of the subjective

A64-80975

equidistance point towards the inspection positions. The results fit in with an explanation in terms of a Gibson-type adaptation process. There is no evidence of stereoscopic fatigue or binocular image "inversion." A figural after-effect in depth, if present, is small compared to the adaptation effect. An explanation in terms of cyclotorsion or other eye movements seems impossible. A central shift in the stereoscopic disparity mechanism could account for the results, but so also could a monocular scale shift produced by the "anchor" effect of the inspection edges.

A64-80975

BRAIN TEMPERATURES IN THE RAT DURING EXPOSURE TO LOW ENVIRONMENTAL TEMPERATURES.

Peter Lomax, E. Malveaux, and R. E. Smith (Calif. U., Med. School, Depts. of Pharmacol. and Physiol., Los Angeles). *American Journal of Physiology*, vol. 207, 1964, p. 736-739. 12 refs. Grant No. NCIR-G-CA-04271-04.

Exposure to cold is known to elicit a rise in metabolic rate in various tissues of homeothermic animals. The role of the hypothalamus in this response was investigated by exposing normal and cold-acclimated rats to environmental temperatures of 26°, 6°, and -8° C and comparing the temperature changes in the thalamus, hypothalamus, and rectum using chronically implanted thermocouples. At all environmental temperatures the cold-acclimated rats had lower hypothalamic temperatures than did the normal animals. Apart from this, the pattern of response was similar in all animals; the hypothalamic temperature tends to increase with exposure of the animal to cold while the adjacent thalamic region shows a marked fall in temperature, the rectal temperature staying fairly constant. This difference in response suggests increased metabolic heat production in the hypothalamus on exposure of the rat to low temperatures.

A64-80976

THE PENSACOLA SLOW ROTATION ROOM WITH SPECIAL REFERENCE TO DISORIENTATION AND MOTION SICKNESS IN SPACE FLIGHT.

S. C. Dunn.

Journal of Royal Naval Medical Service, vol. 50, 1964, p. 7-13. 15 refs.

The force environment of space travel can be placed into three categories (high linear acceleration, subgravity or lack of gravity, and rotation) to facilitate the selection of devices used in the study of the various functional components of the vestibular apparatus. The significance for space medicine of vestibular experimentation lies principally in the fact that the vestibular, ocular, and proprioceptive systems comprise a powerful perceptual triad which must be properly understood and controlled to prevent disorientation and motion sickness in the space environment. Coriolis acceleration stimulation can occur in man in rotating space vehicles and the psychophysiological manifestations will be the same as those occurring on the slow rotation room (SRR). The Pensacola SRR offers a means of studying the etiology, psychophysiology, and the control of motion sickness and disorientation of all types. Insofar as Coriolis acceleration contributes to the symptomatology, Canal sickness studies on the SRR can be closely related to motion sickness found in any type of transportation regardless of whether the latter is produced by linear or angular acceleration, a combination of the two, or a lack of the acceleration of gravity. The Pensacola SRR is believed to be unique among devices which rotate in that it allows unrestrained movements of several subjects over a prolonged period of time.

A64-80977

NATURE OF A PIGMENTED SUBSTANCE IN THE LABYRINTH.

E. Borghesan (Palermo U., Oto-Laryngol. Clin., Italy).

Acta Oto-Laryngologica, vol. 57, 1964, p. 288-293.

A histological analysis was made of a pigmented substance contained in the form of small dark brown refracting granules in the polymorphous cells of the loose connective tissue of the posterior labyrinth (human, guinea pig, and rabbit). The melanin is present in almost all labyrinths, but in greater quantities in pathological labyrinths. The pigmented cells are macrophages in a defensive system which under physiological conditions is stimulated by endogenous substances originating from embryonal rests or worn-out tissue. This activity gives rise to a histological reaction termed "physiological inflammation". It is suggested that the causal events may also be small hemorrhages either spontaneous or traumatic for which there is an anatomical predisposition.

A64-80978

SUPER- AND SUBLIMINAL BINAURAL BEATS.

J. J. Groen (Utrecht State U., Dept. of Otolaryngol., The Netherlands).

Acta Oto-Laryngologica, vol. 57, 1964, p. 224-230.

Based upon the work of Lane (1925: Binaural Beats, *Physiol. Rev.*, 26, 401-402) and Lehnhardt (1961: Die akustische Korrelation, *Arch. Ohr. Nas. Gehikopftheilk.*, 178, 493-497), the phenomenon of binaural beats was studied. The behavior of the beats as a function of frequency points to three distinctly different frequency regions with an optimum audibility in the range from 90 to 800 c.p.s., less audible from 850 to 1100 c.p.s., audibility failing rapidly beyond 1100 to 1400 c.p.s., and disappearing at 1500 c.p.s. In the optimum range the loudness modulation of binaural beats is comparable to

that of a monaural, about 2 db modulated tone. Binaural beats are detectable at levels of 20 db below threshold in one ear, if the level in the other ear is above or near threshold.

A64-80979

HISTOLOGICAL, THERMAL AND BIOCHEMICAL EFFECTS OF ULTRASOUND ON THE LABYRINTH AND TEMPORAL BONE.

J. Angell James (Liffield House, Clifton Down, Bristol, Great Britain), G. A. Dalton, H. F. Freundlich, M. A. Bullen, P. N. T. Wells, D. A. Hughes, and J. Chow.

Acta Oto-Laryngologica, vol. 57, 1964, p. 306-312.

A new 3-megacycle ultrasonic generator was employed to study the damaging effects of ultrasound on the vestibular end organ in guinea pigs, sheep, and on an isolated post-mortem human temporal bone. Upon exposing the lateral semicircular canal, bone thickness was reduced to 1/4 mm. Ultrasound was applied to the area, using saline as coupling and coolant fluid. Intermittent exposure to 22 watts/cm² was used. The histological studies of decalcified crista of the lateral canal of the sheep showed evidence of damage. The blood vessels were found to be dilated, the neuroepithelium appeared disorganized, and the cuticular membrane was absent. The isolated human temporal bone showed a definite thermal effect. It is indicated that the ultrasonic vibrations increased permeability of the endolymphatic system. In the guinea pigs, the sodium ion concentration of the endolymph increased, the potassium ion concentration decreased after exposure. The perilymph was not affected.

A64-80980

VARIATIONS IN NYSTAGMUS RESPONSE TO STIMULATION, CAUSED BY A NUMBER OF PHYSICAL, MENTAL AND CHEMICAL FACTORS.

F. C. Ormerod.

Acta Oto-Laryngologica, vol. 57, 1964, p. 401-404.

Eye movements in response to various stimuli (light and sound variations, mental problems, activity and relaxation, open or closed eyes, active or passive gaze, and ingestion of various chemical substances) were recorded electro-nystagmographically. Nystagmus responses to each of these stimuli are described and discussed. Of the various chemical substances used in the tests, the barbiturates produced the greatest amount of inhibition of ocular movement and therefore the greatest degree of static control, but at the same time they gave rise to a greater number of unpleasant subjective sensations. Antihistamines gave almost as great a degree of inhibition but the subjective sensations were considerably less. The parasympatholytics gave a relatively poor amount of inhibition. As a remedy for the various forms of travel sickness it appears that the antihistamines give the best results.

A64-80981

LOCAL ACTION OF ACETYLCHOLINE AND OF ANTICHOLINERGIC AND ANTICHOLINESTERASIC SUBSTANCES ON VESTIBULAR FUNCTION [L'ACTION LOCALE DE L'ACETYLCHOLINE, DE SUBSTANCES ANTI-CHOLINERGIQUES ET ANTICHOLINESTERASIQUES SUR LA FONCTION VESTIBULAIRE].

F. Brunetti, G. Rossi, G. Voena, S. Buongiovanni, and G. Cortesina (Turin U., Clin. Otorhinolaryngol.; and Sassari U., Inst. D'Anat. Humaine Normale, Italy).

Acta Oto-Laryngologica, vol. 57, 1964, p. 294-298. 17 refs.

The effects of the direct action of acetylcholine, diisopropylfluorophosphate, tetraethylammonium, and atropine upon the function of vestibular receptors in rabbits were studied. From the results of this research it seems that acetylcholine contributes both to the transmission of the nerve impulses of the ampullar receptors to the efferent fibers, and to the mechanism which regulates the extent of the transmission of these impulses.

A64-80982

TIME COURSES OF BLOOD GAS CHANGES PROVOKED BY LIGHT AND MODERATE EXERCISE IN MAN.

P.-O. Barr, M. Beckman, H. Bjurstedt, J. Brismar, C. M. Hesser, and G. Matell (Karolinska Inst., Dept. of Physiol., Labs., of Aviation and Naval Med., Stockholm, Sweden).

Acta Physiologica Scandinavica, vol. 60, 1964, p. 1-17. 37 refs.

Changes in arterial gas levels in response to constant-load, dynamic exercise (400 and 700 k.p.m./minute for 6 minutes) were studied in 8 healthy male subjects by continuous analyses of arterial pH and O₂ saturation. During pre-exercise rest, spontaneous time-variations in these variables occurred in all individuals at half-minute intervals or longer. These cyclic fluctuations, which were quite marked in some individuals, probably in part explain differences reported as to the magnitude and direction of changes occurring in response to exercise. To eliminate most of such influences on the observed deviations following the onset of exercise, the time-averages over the preceding 3 minutes were chosen as reference levels. Both pH and O₂ saturation, when referred to the blood passing through the left heart, remained essentially constant during the first 20 to 30 seconds following the transitions from rest to exercise and from exercise to rest at both work loads. The arterial (H⁺) rose to reach a plateau during the 3rd and 4th minute (average decrease in pH = 0.022 at 400 k.p.m./minute and 0.036 at 700 k.p.m./minute). Calculated arterial oxygen tension (P_{O₂}) after a transient drop during early exercise, was increased by about 5 mm Hg during the last 3 minutes of exercise.

at both loads. About 30 seconds after cessation of work, arterial (H^+) fell rapidly towards pre-exercise level, whereas arterial P_{O_2} rose markedly to reach its maximal deviation after about 1.5 minutes. The shift towards acidosis during exercise was roughly proportional to the relative intensity of work, whereas no such relationship was observed on the part of the concomitant increment in arterial P_{O_2} .

A64-80983

THE INFLUENCE OF CHLORPROMAZINE ON THE CATECHOLAMINE EXCRETION OF NORMAL AND COLD ACCLIMATED RATS.

G. E. Johnson (Karolinska Inst., Dept. of Physiol., Stockholm, Sweden).

Acta Physiologica Scandinavica, vol. 60, 1964 p. 181-188. 18 refs.

Grant No. AF-EOAR-62-14.

Chlorpromazine was administered to normal rats placed at 30° and 20° C and to cold acclimated rats exposed to 30° and 20° C. Treatment of the animals at 30° C produced no increase in catecholamine excretion. However, rats placed at either 20° or 20° C significantly increased their noradrenaline excretion, and to a lesser extent their adrenaline excretion, following chlorpromazine. These increases, also noted in adrenalectomized rats and associated with hypothermia, could be prevented by pretreatment with a ganglionic blocker. It is concluded that the increase in noradrenaline excretion is a result of a temporary hypothermia produced by chlorpromazine and originates from sympathetic nerve endings.

A64-80984

HEART RATE, ARTERIAL LACTATE CONCENTRATION AND OXYGEN UPTAKE DURING EXERCISE IN OLD MEN COMPARED WITH YOUNG MEN.

T. Strandell (Karolinska sjukhuset, Dept. of Clin. Physiol., Stockholm, Sweden).

Acta Physiologica Scandinavica, vol. 60, 1964, p. 197-216. 35 refs.

Swedish Natl. Assoc.; and Riksidrottsförbundets poliklinikkommitté supported research.

In 121 healthy men aged 30 to 83 years, heart rate, oxygen uptake, arterial lactate and pyruvate concentrations were studied during stepwise increased work loads on a bicycle ergometer. The relationship between heart rate and work load was not affected by age but the final heart rate and work load decreased with age. In the younger ages the most usual reason for breaking off the test was fatigue in the legs, in the higher ages dyspnea. The regression line for log lactate on heart rate during exercise was on a higher level in old men than in young. Blood lactate during exercise was correlated both to the degree of circulatory steady state, the heart rate, and the final work load irrespective of age. The relationship between lactate and excess lactate during exercise was similar in old and young men, excess lactate being equivalent to lactate reduced by 2 mM/liter. In 20 men aged 60 to 83 years there was at 600 k.p.m./minute a negative correlation between mechanical efficiency and heart rate and a positive between oxygen uptake and weight or heart rate. No correlation was found between oxygen uptake or mechanical efficiency and age, degree of circulatory steady state or blood lactate concentration.

A64-80985

FLOW AND PROTEIN CONTENT OF LYMPH IN RESTING AND EXERCISING SKELETAL MUSCLE.

S. Jacobsson and I. Kjellmer (Goteborg U., Dept. of Physiol.; and Gen. Hosp., Dept. of Plastic Surg., Sweden).

Acta Physiologica Scandinavica, vol. 60, 1964, p. 278-285. 12 refs.

Grants No. PHS-G-HE-05675-03; AF-6-EOAR-61-47; Maggie Stephen's Found. for Med. Res.; and Svenska idrottens vetenskapliga forskningsråd.

The study was undertaken to evaluate the role of the lymphatic drainage of the calf muscles of cats in the transport of fluid and proteins from exercising muscle. Pure muscle lymph was obtained from a deep lymph vessel above the knee after exclusion of the paw which otherwise contributes substantially to the flow of lymph in the deep vessels. During exercise the lymph flow in skeletal muscles increases but even then accounts for only 10% of the simultaneously produced capillary filtrate. The protein content of lymph from muscle was about the same as that of lymph from skin. The albumin fraction in muscle lymph was moderately raised compared with that of plasma and did not change during exercise. The lymph can probably drain the entire protein content of the capillary filtrate produced during exercise.

A64-80986

DEPENDENCY ON AGE OF VESTIBULAR EFFICIENCY: A CONTRIBUTION TO THE REGULATORY FUNCTION OF THE VESTIBULAR APPARATUS (DIE ALTERSABHÄNGIGKEIT DER VESTIBULAREN LEISTUNGSFAHIGKEIT: EIN BEITRAG ZUR REGULATIONSFUNKTION DES VESTIBULARISSYSTEMS).

G. Rossberg (Frankfurt U., Hals-Nasen-Ohrenklinik, Frankfurt, Germany).

Archiv für Ohren-, Nasen- und Kohlkopfheilkunde, vol. 181, 1964, p. 475-490. 22 refs. In German.

Rotatory vestibular investigations were carried out with 60 healthy subjects of three age groups (20-40 years; 41-60 years; 61-80 years). Angular accelerations used for each individual were 30, 60 and 90° per second. There were significant differences among the groups in the amplitude and the frequency of nystagmus, and to a lesser extent in the duration of nystagmus.

The differences were expressed in a lowered response as well as in a shift in the relationship among the three values. Thus the curves for the three age groups differ in steepness. The clinical application of the measurement of a vestibular excitability threshold is discussed. It is felt that the use of three different stimulus intensities yields a good insight into the individual's vestibular function.

A64-80987

EXPERIENCES DURING DETERMINATION OF THE "DISTORTION THRESHOLD" (ERFAHRUNGEN BEI DER BESTIMMUNG DER "VERZERRUNGSSCHWELLE").

H. H. Frey (Med. Akad., Hals-Nasen-Ohrenklinik, Erfurt, Germany).

Archiv für Ohren-, Nasen- und Kohlkopfheilkunde, vol. 181, 1964, p. 467-474. 11 refs. In German.

Determinations of the threshold of distortion were carried out for prediction of susceptibility to acoustic trauma. Four of the thirty subjects had a significantly lowered threshold of distortion, which also corresponds to the frequency of special susceptibility to noise injury for the general population. However, the threshold of distortion is unsuitable for routine mass screening as part of noise injury prophylaxis, because the judgment of appearance or disappearance of distortion is extremely vague in the great majority of subjects. The statistical analysis of data reflects this vagueness particularly in comparison with determinations of hearing thresholds.

A64-80988

GRAVITATIONAL STRESS: CHANGES IN CORTICAL EXCITABILITY.

Anthony N. Nicholson (Royal Air Force Inst. of Aviation Med., Farnborough, Hampshire, Great Britain).

Science, vol. 145, Sep. 25, 1964, p. 1458-1459. 6 refs.

Evoked responses, recorded from the visual cortex, are enhanced during positive (head to tail) acceleration, and during cerebral hypotension induced by hemorrhage. The phenomenon observed during positive acceleration may therefore be due, at least in part, to its hypotensive effect, but the increased somatic stimulation must also be considered.

A64-80989

FLIGHT SIMULATOR SYSTEM OF NATIONAL AEROSPACE LABORATORY AND SOME EXPERIMENTS ON MANUAL CONTROL.

Akiyoshi Matsunaga, Moriyuki Momona, Noriko Miyoshi, Masanori Okabe, and Sumiko Ishikawa (Nat'l. Aerospace Lab., Tokyo, Japan).

Japanese Journal of Aerospace Medicine and Psychology, vol. 1, Jun. 1964, p. 67-81. 5 refs. In Japanese.

The flight simulator system of the National Aerospace Laboratory (Japan) consists of an analog computer unit (A/C), a flight table unit (F/T), and a moving cockpit unit (C/P). It carries out research on flight performance, stability, and controllability of aircraft involving autostabilizers and human pilots. Constitutional and functional explanations of this system are given, and examples of some experiments on manual control are introduced.

A64-80990

CARDIAC OUTPUT DURING EXERCISE AND ANAEROBIC METABOLISM IN MAN.

H. D. Thomas, Buris Boshell, Carlos Gaos, and T. J. Reeves (Ala. Med. Coll., Dept. of Med.; and Birmingham Veterans Admin. Hosp., Birmingham).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 839-848. 22 refs.

Grants No. PHS-G-H-5332; and PHS-G-H-6353.

The concentration time course of lactate, pyruvate, and excess lactate during 4 min of exercise and 30 min of recovery was studied in 20 patients with heart disease and in 8 normal subjects. The level of excess lactate accrued from the exercise was found to correlate well with the level of delta oxygen consumption in normal subjects ($r = .922$). The cardiac output of the subjects with heart disease was considered in relation to the regression of cardiac output on oxygen consumption for normal subjects previously established by Donald (*Clin. Sci.* 14: 37-73, 1955). The patients with subnormal cardiac outputs during exercise had higher excess lactate values and lactate/pyruvate ratios than normal subjects and patients with normal cardiac outputs at similar levels of work. Normal subjects carrying out more severe work showed even higher concentration of excess lactate than did the patients with heart disease at lower work levels. The increase in excess lactate was maximal during the 2nd minute of submaximal exercise. The rate of increase was progressively diminished during succeeding minutes.

A64-80991

EFFECT OF ENVIRONMENTAL TEMPERATURE ON HAMSTER BODY FAT COMPOSITION.

Arthur M. Kodama and Nello Pace (Calif. U., Dept. of Physiol., Berkeley).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 863-867. 21 refs.

Contract Nonr-222(38).

Body fat content and the melting point and fatty acid composition of body fat of hamsters exposed to 35°, 27°, 20°, 15°, 10°, and 6° C for 2 weeks were determined. The relationship between exposure temperature and body fat content and composition resembled that between environment temperature and metabolic rate. Below the critical temperature, there was a progressive

decrease in total body fat content and melting point accompanied by a decrease in the mole fraction of palmitic acid and an increase in the mole fraction of oleic acid. The softening of body fat in cold exposed animals appears to be the result of an increased mobilization of depot fat in response to a higher metabolic rate in the cold, a mobilization which is at least partially selective with respect to individual fatty acids or triglycerides. Examination of changes in whole body composition revealed that 72% of the loss in body weight of hamsters exposed to 6°C was due to a decrease in body fat content. In contrast, the decrease in body fat content accounted for only 28% of the body weight loss of pair-fed hamsters kept at 27°C on reduced caloric intake to match the body weight loss experienced by cold-exposed animals. It appears, therefore, that cold exposure induces a more effective fat depot mobilization than does reduced caloric intake.

A64-80992

ANTICIPATORY, EXERCISE, AND RECOVERY HEART RATES OF GIRLS AS AFFECTED BY FOUR RUNNING EVENTS.

Vera Skubic and Jane Hilgendorf (Calif. U., Santa Barbara).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 853-856. 17 refs.

Am. Assoc. for Health supported research.

The heart rate response to running various distances was studied using five highly trained girls as subjects. A telemetering instrument was employed so that the testing could be done under actual sport conditions. The findings indicated that (1) the anticipatory heart rate just prior to exercise represents 59% of the total adjustment to exercise, (2) the heart rates during exercises were 2.5 times the resting values, and (3) heart rates observed at the end of the 220-, 440-, 880-yard, and mile events were similar.

A64-80993

VENTILATORY RESPONSE TO INTERMITTENT INSPIRED CARBON DIOXIDE.

R. E. Dutton, V. Chernick, H. Moses, B. Bromberger-Barnea, S. Permutt, and R. L. Riley (Johns Hopkins U., School of Hyg. and Public Health, Dept. of Environ. Med., Baltimore, Md.)

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 931-936. 11 refs. Grants No. NIH-G-AP-208; NIH-G-HTS-5453; and NIH-G-HE-01929.

The hypothesis that cyclic variation of CO₂ tension of the arterial blood (Pa_{CO₂}) about its mean produces an additional stimulus to ventilation was tested in the dog. Oscillations of alveolar carbon dioxide tension were produced by the intermittent administration of 20% CO₂ for 1 breath every 7-12 breaths. The increment in ventilation per mm Hg rise in mean Pa_{CO₂} was compared in nine adult dogs anesthetized with sodium pentobarbital. Thirteen experiments with oscillating CO₂ and eighteen with steady CO₂ were performed. In all except one animal, the increase in ventilation per mm Hg change in mean Pa_{CO₂} was greater during intermittent CO₂ than during steady CO₂. In three experiments intermittent administration of CO₂ caused a ventilatory response sufficient to lower the mean Pa_{CO₂} below control values. The increment in total ventilation per mm Hg rise in arterial carbon dioxide tension for steady CO₂ breathing was 0.58 liters/min. per mm Hg and for intermittent CO₂ was 2.00 liters/min. per mm Hg. These findings support the concept that chemoreceptors are stimulated by oscillations of Pa_{CO₂} as well as by the mean level of Pa_{CO₂}. The oscillatory stimulus appears not to be related to the amplitude of the oscillation or to the peak Pa_{CO₂} attained, but rather to the rate of increase of arterial Pa_{CO₂}.

A64-80994

SPECIFIC GRAVITY OF HUMAN SUBJECTS BY AIR DISPLACEMENT AND HELIUM DILUTION.

V. M. Hix, A. M. Pearson, and E. P. Reineke (Mich. State U., Depts. of Food Sci. and of Physiol. and Pharmacol., East Lansing).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 955-958. 7 refs.

NIH Grant AM 04172-02.

Body volumes for 24 men and 24 women were determined using both the air-displacement and helium-dilution procedures. Specific gravity values were calculated and computed. The two methods of determining body volume showed extremely good agreement, with a correlation of 0.99 for both men and women. The correlation between specific gravity values was 0.96 for men and 0.91 for women. Thus, the overall agreement between the two methods was relatively good, although the mean deviation was relatively large. The major sources of error for the helium dilution procedure appeared to be due to changes in temperature, to irregular accumulation of carbon dioxide within the chamber, and to difficulty in setting the current to the thermal conductivity cell at precisely the same level. The major sources of error in the air-displacement method seemed to be due to changes in temperature, changes in relative humidity, and lack of precision in making pressure readings on the manometer.

A64-80995

BASAL METABOLISM AND RESPIRATION IN MEN LIVING AT 5,800 M (19,000 FT.).

M. B. Gill and L. G. C. E. Pugh (Natl. Inst. for Med. Res., Div. of Human Physiol., Med. Res. Council Labs., London, Great Britain).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 949-954. 26 refs. Med. Res. Council; and Wellcome Trust supported research.

Respiratory determinations were carried out on eight members of the Himalayan Scientific and Mountaineering Expedition of 1960-1961 and three Sherpas during a prolonged stay at 5,800 m (19,000 feet). Ventilation and oxygen uptake were similar in both groups, although the Sherpas were smaller men. The Sherpas had lower alveolar ventilation, higher PA_{CO₂} and lower PA_{O₂} values than the scientists. Among six of the scientists, mean basal metabolic rate was 10% above the mean value predicted from sea-level standards. There was no increase in the two others, who did not acclimatize. The mean basal metabolic rate in the three Sherpas was +21%. The findings were not explained by the extra O₂ cost of increased breathing, changes in body composition, or exposure to cold, although this may have been a factor in the Sherpas. The results were similar to recent South American data on residents at 4,540 m (14,900 feet). It was concluded that acclimatization to great altitudes in man is associated with increase in basal metabolism, but there is insufficient evidence as to whether this is a response to hypoxia or other environmental factors.

A64-80996

CIRCULATORY RESPONSE TO PROLONGED SEVERE EXERCISE.

Bengt Saltin and Jesper Stenberg (Kungliga Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 833-838. 24 refs. Försvärmed, nämnden; Swedish Nat. Assoc. against Heart and Chest Diseases; and Swedish Sports Federation supported research.

Four subjects worked on a treadmill or a bicycle ergometer for 180 minutes at oxygen uptakes of 75% of the individual's max. Vo₂; after 90 minutes rest, the exercise was resumed and a maximal workload was tried. Repeated circulatory studies were made. The body weight decreased 3.1 kg (3.2-5.2%), but the reduction in blood volume was less than 5%. During submaximal exercise the major change in the hemodynamic response was a decrease in stroke volume (from 12.6 to 10.7 ml). Oxygen uptake and cardiac output increased slightly. There was a decrease of about 10% in systolic, diastolic, and mean arterial blood pressure during the 180 minutes of exercise. When the work was performed in a supine position there was the same reduction in the stroke volume as in the sitting work position. At the maximal work oxygen uptake, cardiac output, heart rate, and blood pressure attained almost normal values but there was a marked decrease in both work time and blood lactates.

A64-80997

EFFECTS OF MASS LOADING THE RESPIRATORY SYSTEM IN MAN.

J. T. Sharp, J. P. Henry, S. K. Sweany, W. R. Meadows, and R. J. Pierras (Cardiopulmonary Lab. of the Veterans Admin. Hosp., Hines, Ill.; Ill. U., Coll. of Med., Dept. of Med.; and Loyola U., Stritch School of Med., Chicago).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 959-966. 13 refs. Grant No. NIH-G-H5124.

Mass loading of the thorax in four normal conscious subjects and in six anesthetized paralyzed subjects transposed the thoracic volume-pressure curve to higher levels on the pressure axis without greatly affecting the slope of its linear portion. This effect is similar to that produced by forward acceleration and snorkel breathing. Mass loading the lower thorax produced a greater effect than mass loading the upper thorax. Mass loading the abdomen flattened the slope of the linear portion of the thoracic-volume pressure curve both in conscious subjects and in anesthetized paralyzed subjects, the effect resembling that of elastic loading which also flattened the thoracic volume-pressure curve. The shape of the total respiratory static volume-pressure curves in six of ten excessively obese subjects resembled that produced by thoracic mass loading in normal subjects. Five patients with the obesity-hypoventilation syndrome had curves suggesting a combination of elastic and mass loading or alternatively, abdominal mass loading. At any lung volume, the total transrespiratory static pressure is made up of a volume-dependent elastic component and a volume-independent gravitational component. The latter is approximately 5 cm H₂O in the supine adult male of normal weight.

A64-80998

EFFECT OF SOME DRUGS ON REFLEX VASODILATATION OF HAND PRODUCED BY RADIANT HEATING OF TRUNK.

Otto Appenzeller and Harold Schnleder (Harvard Med. School, Dept. of Neurol., Mass. Gen. Hosp., Boston; and Nat. Hosp., Inst. of Neurol., London, Great Britain).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 995-998. 12 refs.

The effect of some drugs on reflex vasodilatation in the hand was studied. Bretylium tosylate and phenoxybenzamine abolished the reflex vasodilator response in the hand caused by cradle heating of the chest. Alpha methyl dopa, nethalide, and atropine had no effect on this response. It is suggested that the tonic constriction of hand vessels maintained by sympathetic fibers and alpha adrenergic constrictor receptors is temporarily interrupted by 40 second cradle heating of the chest and that this produces the observed increase in hand blood flow. The reflex increase in hand blood flow with short cradle heating of the

chest appears to utilize a common efferent pathway with the vasodilator response produced in the hand by prolonged heating of the legs. On the afferent side, however, these reflexes use different mechanisms.

A64-80999

VESTIBULAR HABITUATION DURING REPETITIVE COMPLEX STIMULATION: A STUDY OF TRANSFER EFFECTS.

Fred E. Guedry, Jr., William E. Collins, and Ashton Graybiel (U.S. Naval School of Aviation Med., Pensacola, Fla.; and Civil Aeromed. Res. Inst., Oklahoma City, Okla.)

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 1005-1015. 32 refs.

Thirty-two men were rotated at 7.5 rev/min, while facing the center of the Pensacola slow rotation room for several hours. The men were seated 4 feet from the center of rotation; direction of rotation was towards the subject's left. During rotation, subjects were immobile except for series of measured head movements restricted to the frontal plane and to a particular quadrant of that plane for each subject. Nystagmus, illusory phenomena, and nausea were reduced by this procedure, but this habituation did not transfer to other forms of vestibular stimulation including that induced by head movements in an "unpracticed" quadrant of the same plane. Residual effects exhibited in "static tests" after the habituation program were primarily restricted to the practiced quadrant.

A64-81000

STATIC VOLUME-PRESSURE CHARACTERISTICS OF THE RESPIRATORY SYSTEM DURING MAXIMAL EFFORTS.

Charles D. Cook, Jere Mead, and Marcello M. Ozaleski (Harvard Med. School, Dept. of Pediatr.; Children's Hosp. Med. Center, Dept. of Med.; Harvard School of Public Health, Dept. of Physiol., Boston, Mass.)

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 1016-1022. 15 refs.

Grants No. NIH-G-HD-00248-04; NIH-G-2A-5276; NIH-G-AP-00229-01; and NIH-G-2A-409(C2).

Maximal expiratory and inspiratory static airway pressures at different lung volumes were measured in 56 normal subjects of both sexes ranging in age from 6 to 64 years. A new method was used requiring a special mouthpiece, a series of containers of different volumes (allowing volume combinations from 1.5 to 200 liters), and a manometer. The subjects breathed into or out of the containers as forcibly as possible; the lung volumes corresponding to the maximal pressures developed were calculated by Boyle's law. The results are compared with those obtained by other authors. The maximal pressures developed by our subjects, particularly on expiration, were considerably higher than most published values. This was probably the result of using a special mouthpiece which provided an adequate seal even at high pressures. One experienced subject obtained pressures as high as 300 cm H₂O on expiration and 200 cm H₂O on inspiration.

A64-81001

RESPIRATORY DEPRESSION AFTER CHRONIC IRRADIATION WITH GAMMA RAYS AND PHOTOREACTIVATION IN CHLORELLA [ATMUNGSDEPRESSION NACH CHRONISCHER γ -BESTRAHLUNG UND PHOTOREAKTIVIERUNG BEI CHLORELLA].

F. Küssler (Deutsches Zentralinst. für Arbeitsmed., Berlin-Lichtenberg 4, und Inst. für Biophys. der Deutschen Akad. der Wissenschaften zu Berlin, Berlin-Buch, Germany)

Naturwissenschaften, vol. 51, 1964, p. 289. 5 refs. In German.

A thermophilic strain of *Chlorella pyrenoidosa* was investigated in a closed ecological system under (a) normal conditions without irradiation, (b) irradiation with Cobalt-60, (c) irradiation with Iridium-192, and (d) irradiation with Cesium-137. Without irradiation, respiration and photosynthesis of the algae remained constant over a ten day period. In experiments with CO₂ in doses of 100,000 r or more, release of CO₂ increased due to accelerated endogenous respiration. The rate of actual photosynthesis calculated on basis of apparent photosynthesis and respiration in continuous darkness did not differ from controls. Chronic irradiation with Ir-192 and Cs-137 depressed endogenous respiration to a third of the initial value after five to six days in continuous darkness. Further irradiation did not change this value in the next two days. Spontaneous recovery did not occur after cessation of irradiation. Photosynthesis was not affected by irradiation with Ir-192 and Cs-137; respiration remained normal under intermittent illumination. Illumination of algae after respiration has been depressed by darkness, resulted in return of normal CO₂ release. Recovery takes place also under conditions excluding photosynthesis. These recovery processes are reminiscent of photoreactivation which has been demonstrated after ultraviolet irradiation and may also take place after exposure to ionizing radiation.

A64-81002

RESPONSES OF THE HUMAN UPPER EXTREMITY VASCULAR BED TO EXERCISE, COLD, LEVARTERENOL, ANGIOTENSIN, HYPERTENSION, HEART FAILURE, AND RESPIRATORY TRACT INFECTION WITH FEVER.

L. J. Kettell, H. W. Overbeck, R. M. Daugherty, J. P. Lillehei, R. F. Coburn, and F. J. Haddy (V. A. Res. Hosp., Chicago, Ill.; Minn. U. Med. School, Depts. of Physiol. and Med., Minneapolis; Northwestern U. Med. School, Chicago, Ill.; and Okla. U. Med. Center, Oklahoma City).

Journal of Clinical Investigation, vol. 43, Aug. 1964, p. 1561-1575. 64 refs. Grants No. PHS-G-A1-03714; PHS-G-HE-062860; PHS-G-HE-06759; and AHA-G-62-G-16

Among the many tests described in this study are those dealing with responses of the vascular bed to the upper extremity to changes in position, exercise, various drugs, organic substances, and cold. Changes of position did not significantly alter pressures (the higher average values in normal subjects while sitting and standing resulted mainly from changes in only one subject). Exercise, however, elevated pressures in both normal subjects and patients. In normal subjects intrabrachial injection of levarterenol or angiotensin produced a transient fall in small venous pressure followed by a relatively sustained rise above the control value. Subcutaneous tissue temperature in the area of the small vein started falling shortly after injection and remained low during the pressor phase. Acetylcholine produced a slow large rise in small venous pressure.

A64-81003

PERIPHERAL VIEWING AND SIMULTANEOUS CONTRAST.

Peter Burgh (Cambridge U., Psychol. Lab., Cambridge, Great Britain). *Quarterly Journal of Experimental Psychology*, vol. 16, Aug. 1964, p. 257-263. 7 refs.

An experiment was done to find the effect on simultaneous brightness contrast of viewing the test patches foveally or peripherally, at a distance of 3° or 6° from the fovea. It was found that contrast was greater in the periphery. It was also found that contrast increased with prolonged viewing of the display. A further experiment showed that blurring the test patches produced an increase in contrast.

A64-81004

NOISE AND THE SHIFTING OF ATTENTION.

W. M. S. Samuel (Queen's Coll., Dept. of Psychol., Dundee, Great Britain). *Quarterly Journal of Experimental Psychology*, vol. 16, Aug. 1964, p. 264-267. 10 refs.

An experiment was carried out to test the hypothesis that performances on a task which involves a shift of attention between spatially separated sources would be lower under noise conditions than one which involved no such shift. The results indicated that the hypothesis was not proved; rather they showed that the subject's performance on the shift of attention task was better under noise than under quiet. An attempt is made to put forward possible reasons for this occurrence.

A64-81005

MEASUREMENT OF STRESS IN FASTING MAN.

Edward J. Kollar, Grant R. Slater, James O. Palmer, Richard F. Docter, and Arnold J. Mandell (Calif. U. Center for the Health Sci., Dept. of Psychiat. and Neuropsychiat. Inst.; and Veterans Admin. Center, Dept. of Neurobiochem., Los Angeles).

Archives of General Psychiatry, vol. 11, Aug. 1964, p. 113-125. 31 refs. Grants No. CDMH-G-60-2-18; CDMH-G-61-2-22; and NIH-G-NB03556.

Seven healthy adult males were studied with a variety of psychological (e.g., Holtzman Ink Blot Test, Thematic Apperception Test, Minnesota Multiphasic Personality Inventory Test, and Clyde Mood Scale), physiological (sublingual temperature), and biochemical (blood glucose, hematocrit, glucose tolerance, plasma corticoid, plasma cholesterol, α -ketol steroids, creatinine, and 17-ketosteroids) measures over a period of seven days wherein two of the men fasted for four days, three fasted for six days, and two served as controls. Although the fasting subjects showed individual differences, all revealed progressive decrease of activities requiring energy expenditure, and there were frequent complaints of fatigue, weakness, and a tendency toward greater irritability. Despite indications of slowing of speech, motion, and lapses in intellectual efforts especially evidenced in "off guard" moments, the subjects were able to mobilize themselves for specific tasks. In addition, a stress responsive indole substance was measured reflecting significant differences between fasting and control subjects. It is concluded that fasting over this period of time does serve as a stressful experience, although this is apparently not reflected in adrenal cortical activation.

A64-81006

INTRODUCTION TO HUMAN BODY DYNAMICS.

Ernest L. Stech (Frost Eng. Develop. Corp., Englewood, Colo.). *Journal of Environmental Sciences*, vol. 7, Aug. 1964, p. 36-40. 6 refs.

A statistical analysis is presented of the variability in proportional limit strength and endplate fracture strength of the thoracic and lumbar vertebrae. Data from experiments done on cadavers exposed to acceleration stress were corrected for age factor and vertebra position. Mean breaking strengths for proportional limit fractures were calculated. Distribution of endplate breaking strengths is calculated in terms of steady state accelerations. Curves expressing the probability of damage to the vertebrae are given, and injury rates concerning ejection seat performance are discussed.

A64-81007

HEART RATE DURING TRANSITION FROM REST TO EXERCISE, IN RELATION TO EXERCISE TOLERANCE.

C. T. M. Davies and E. A. Harris (Edinburgh U., Depts. of Phys., Educ. and Physiol., Scotland).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 857-862. 14 refs.

Thirty-four healthy subjects of different ages and sex were studied during exercise on a motor-driven treadmill. Heart rate was measured continuously, oxygen consumption was measured during the steady state of exercise, and in 15 subjects the maximum oxygen consumption was also determined. From these data three standard indices of working capacity were calculated, together with an index based upon the "pulse deficit" of early exercise, for comparison with each other and with the maximum oxygen consumption. The "pulse deficit index" was found to express relative working capacity slightly better than any of the standard indices.

A64-81008

PHYSIOLOGICAL REACTIONS TO COLD OF CAUCASIAN FEMALES.

C. H. Wyndham, J. F. Morrison, C. G. Williams, G. A. G. Bredell, J. Peter, M. J. E. von Rahden, L. D. Holdsworth, C. H. van Graan, A. J. van Rensburg, and A. Munro (Transvaal and Orange Free State Chamber of Mines, Appl. Physiol. Lab., Johannesburg, South Africa).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 877-880.

The physiological reactions to cold of nine female Caucasians were examined and compared with the reactions of a sample of male Caucasians. The experiment was conducted in the climatic chamber of the Applied Physiology Laboratory at air temperatures of 27° and 5° C, with a wind velocity of 80 to 100 ft/min. The sample of nine did not provide for intermediate temperature studies. The metabolic rates of the females were lower than those of the males, at both 27° and 5° C, but when expressed per square meter no differences were found. Finger and toe and rectal temperatures were the same for both sexes at 5° C, but the average female finger temperature was lower than that of the males at 27° C. The average female skin temperature was 2° C lower than that of the males. This indicates a greater subcutaneous insulation for females, and this is confirmed by skinfold measurements. Both Caucasian sexes therefore display an increase in rectal temperature with fall in air temperature, which contrasts markedly with the Bantu and Bushman, both of whom show a decrease in rectal temperatures.

A64-81009

PULMONARY AND SYSTEMIC HEMODYNAMICS OF PASSIVELY HYPERVENTILATED DOGS.

Leonard M. Linde, Daniel H. Simmons, Bertrand J. Shapiro, and Stanley Goldberg (Calif. U., School of Med., Depts. of Pediat., Physiol., and Med.; and Mount Sinai Hosp., Los Angeles).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 928-930. 22 refs. Grant No. PHS-G-HE-05137.

The effects of respiratory alkalosis on pulmonary and systemic hemodynamics in the intact anesthetized dog were measured and compared to a control period with normal pH and carbon dioxide tension. Pulmonary artery, pulmonary vein, and systemic artery pressures were measured through fluoroscopically placed cardiac catheters. Transmural pressures were determined by subtraction of intrapleural from vascular pressures. Cardiac output was determined in duplicate by the indicator-dilution technique using Cardio-green. Respiratory alkalosis in passively hyperventilated intact anesthetized dogs did not significantly alter cardiac output, or systemic or pulmonary vascular resistance in 13 experiments. The possibility that increased intratracheal pressure during hyperventilation may have mechanically masked a decrease in pulmonary vascular resistance was ruled out in a second series of 17 experiments in which intratracheal pressure was maintained constant. An inverse relationship between pulmonary vascular resistance and pH was not found in this study.

A64-81010

pH-TEMPERATURE CONVERSION FACTORS AND PCO₂ FACTORS FOR HYPOThERMIA.

William H. Austin, Eleanor H. Lacombe, and Peter W. Rand (Me. Med. Center, Dept. of Cardiol., Cardiorespiratory Section, Portland).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 893-896. 7 refs. Grant No. NIH-G-HTS-5475.

The change in pH per degree centigrade was re-evaluated in groups of normal and ill adults. The results indicate that the ΔpH per degree centigrade is relatively constant in a given individual and of the order of -0.015 for every degree increase in the temperature. Errors in hypothermic work may be minimized by using a water-bath setting midway between the highest and the lowest temperatures anticipated. These findings tend to support previous figures in both magnitude and range. Procedural accuracy is emphasized and technical difficulties in pH measurements are suggested as possible sources of disagreement raised by one investigator. Carbon dioxide tension (pCO₂) factors are given for temperatures from 20° to 38° C for rapid calculation of pCO₂ from CO₂ content and pH corrected for temperature.

A64-81011

PHYSIOLOGICAL REACTIONS TO COLD OF BUSHMEN, BANTU AND CAUCASIAN MALES.

C. H. Wyndham, J. F. Morrison, J. S. Ward, G. A. G. Bredell, M. J. E. von Rahden, L. D. Holdsworth, H. G. Wenzel, and A. Munro (Transvaal and Orange Free State Chamber of Mines, Appl. Physiol. Lab., and Math.-Statist. Div., Johannesburg, South Africa).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 868-876. 10 refs.

Two separate studies of the reactions to cold of one sample of 8 and one sample of 15 Kalahari Bushmen were made in their natural habitat and the results compared with Bantu and, to a smaller extent, with Caucasian subjects. With a decrease in temperature from 27° to 5° C the metabolisms of all three groups rose. Metabolic rates per square meter of Bantu and Bushmen were similar, although higher than those of the Caucasians, but the percentage increases were closely similar for all groups. Rectal temperatures of Bushmen and Bantu were similar and decreased as the temperature dropped, while that of the Caucasians rose. Toe and finger temperatures of the Bushmen were higher over the whole temperature range than those of the Bantu and Caucasians, while the average skin temperatures were closely similar. Metabolic rates and rectal temperatures, therefore, indicate that subcutaneous tissue insulation against heat flow is greater for the Caucasians than for the Bantu or the Bushmen. Measurements of average skinfold thicknesses confirm this finding. Bushmen and Bantu reactions are quantitatively similar, but are qualitatively slightly different. From these findings we conclude that the difference between Bushmen, Bantu, and Caucasians is essentially morphological.

A64-81012

INFLUENCE OF TEMPERATURE ON BLOOD PH OF THE HUMAN ADULT AND NEWBORN.

Karlis Adamsons, Jr., Salha S. Daniel, Gillian Gandy, and L. Stanley James (Columbia U., Coll. of Physicians and Surgeons, Dept. of Obstet. and Gynecol., Anesthesiol., and Pediat., Presbyterian Hosp., Divs. of Obstet. and Gynecol., (Sloane Hosp.); and Anesthesiol., and Pediat., (Babies Hosp.) New York City). *Journal of Applied Physiology*, vol. 19, Sep. 1964, p. 897-900. 7 refs. Grants No. PHS-G-RG-9069; and HS-G-A-4359.

The effect of temperature upon pH of blood from adult and newborn humans was investigated. Although the mean ΔpH/ΔT values for the two populations differed, 0.0144/° C for adults versus 0.0128 for the newborn, this was not peculiar to the source since the temperature-induced pH changes were identical when comparison was made between samples of similar pH and CO₂ content. It was shown that even over the physiologic pH range ΔpH/ΔT were observed with oxygenation of hemoglobin. The influence of red cell concentration was detectable only when hematocrit values fell below 20%. A graph and an equation for the determination of ΔpH/ΔT of blood with a given pH and CO₂ content is presented.

A64-81013

RELATIVE COMPLIANCES OF WELL AND POORLY VENTILATED SPACES IN THE NORMAL HUMAN LUNG.

K. T. Fowler (Sydney U., Dept. of Med., Biophys. Lab., Australia).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 937-945. 14 refs.

A series of experiments was performed in each of which the subject inspired a .25-liter bolus of argon in a large breath consisting otherwise of air. The slope of the argon plateau in the subsequent expiration was found to depend upon the lung volume at which the bolus was administered. When inspiring from residual volume to total lung capacity, bolus injection at a low lung volume led to a rising plateau; injection at medium volume led to a flat plateau; and at a high lung volume to a steeply falling plateau. From measurements of the different plateau slopes it was possible to deduce the ratio of the effective compliances shown at any lung volume by the "well" and "poorly" ventilated alveolar populations. In four normal subjects this ratio rose from about 0.5 at residual volume to about 4 near total lung capacity. The qualitative behavior of the two populations resembled that of the upper and lower zones of the erect lung, as indicated by the nature of the cardiac oscillations on the expired gas plateaus.

A64-81014

PHYSIOLOGICAL REACTIONS TO HEAT OF BUSHMEN AND OF UNACCLIMATIZED AND ACCLIMATIZED BANTU.

C. H. Wyndham, N. B. Strydom, J. S. Ward, J. F. Morrison, C. G. Williams, G. A. G. Bredell, M. J. E. von Rahden, L. D. Holdsworth, C. H. van Graan, A. J. van Rensburg, and A. Munro (Transvaal and Orange Free State Chamber of Mines, Appl. Physiol. Lab., and Math.-Statist. Div., Johannesburg, South Africa).

Journal of Applied Physiology, vol. 19, Sep. 1964, p. 885-888.

Bushmen in the Kalahari desert fulfill two criteria for acclimatization to heat. They exercise actively, in hunting, in relatively severe heat in midsummer. Compared with unacclimatized Bantu they have higher sweat rates per square meter and lower heart rates. However, rectal temperatures are not much lower than those of unacclimatized Bantu. River Bushmen present a paradoxical picture. In summer sweat rates are higher than in winter, but are not as high as desert Bushmen. Summer heart rates are, however, higher than in winter. Rectal temperatures in the two seasons are similar. The higher

sweat rates in summer are good evidence of better acclimatization than in winter; the higher heart rates may be a reflection of differences in physical fitness in the two seasons.

A64-81015

REDUCTION OF RETROACTIVE EFFECTS OF INTERPOLATED MAZE TRAINING IN HYPOTHERMIC MICE.

Walter B. Essman and Frederick N. Sudak (Albert Einstein, Coll. of Med., Dept. of Physiol., Bronx, N.Y.)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 889-892. 12 refs.
 Grant No. NIH-G-MH-05140-03.

In two experiments the retroactive effect of maze training interpolated between an initial acquisition phase and a testing phase was determined in mice. In the first experiment a retroactive inhibitory effect was demonstrated in animals given interpolated training for the reversal of an acquired maze response. In the second experiment the interpolated activity was either habit reversal, overtraining, or practice swimming. When the interpolated activity was initiated in the presence of hypothermia habit reversal did not occur, no retroactive inhibition was shown, and facilitation of performance from over-training or practice swimming was negated. The data support the hypothesis that hypothermia maintained during maze training reduces the negative (retroactive inhibition) as well as positive (facilitation) effects that such training has upon the performance of a previously acquired maze habit.

A64-81016

HYPERBARIC OXYGEN AND PERSISTENCE OF VISION IN RETINAL ISCHEMIA.

R. Carlisle, E. H. Lanphier, and H. Rahn (N.Y. State U. at Buffalo, Dept. of Physiol.)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 914-918. 10 refs.
 Contract No. Nonr 969(03).

When retinal ischemia is produced by elevating the intraocular tension, normal vision persists for about 4 sec. in healthy subjects breathing air at atmospheric pressure. Persistence times were determined at alveolar oxygen pressures up to 4 atm. abs. (3,000 mm Hg), obtained by oxygen breathing in a high-pressure chamber. Below an alveolar P_{O_2} of 2 atm., the rise in persistence time is relatively small. Above that level the time increases in direct proportion to the increase in alveolar P_{O_2} and may exceed 50 sec. at 4 atm. The rise of persistence time follows a pattern similar to that of computed blood oxygen pressure assuming an oxygen extraction of about 3 vol %.

A64-81017

LIMITATIONS TO PREDICTION OF MAXIMAL OXYGEN INTAKE.

Loring B. Rowell, Henry L. Taylor, and Yang Wang (Minn. U., Dept. of Med., Lab. of Physiol., Hyg., Minneapolis)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 919-927. 28 refs.
 Grant No. NIH-G-H-5858.

The predictability of maximal $\dot{V}O_2$ intake (max. $\dot{V}O_2$) was studied in four groups of normal men, 18 to 24 years of age. Prediction of max. $\dot{V}O_2$ was made from pulse rate and $\dot{V}O_2$ at a single submaximal workload at an ambient temperature of 78° F by use of the nomogram of Åstrand and Ryhmä (1954) and underestimated actual max. $\dot{V}O_2$ by 27% ± 7% and 14% ± 7% in a sedentary group, before and after 2 1/2 to 3 months of physical training, and by 5.6% ± 4% in a group of ten endurance athletes. Accuracy of prediction in all groups varied with approximation of pulse rate to 128 beats/min at 50% of max. $\dot{V}O_2$. Nonspecific stresses increased predictive errors in all groups. Constants b (slope) and A (intercept) in the regression equation $\dot{V}O_2 = bP - A$ (where P is pulse rate), were determined from $\dot{V}O_2$ and pulse measured at four submaximal workloads requiring 13 to 28 ml. O_2 /kg min. Prediction of max. $\dot{V}O_2$ by extrapolation of the slope to maximal pulse rate resulted in underestimation of 700 to 800 ml O_2 /min. Removal of 14% of circulating hemoglobin decreased max. $\dot{V}O_2$ by 4% but there was no change in pulse rates or predicted max. $\dot{V}O_2$. The relationship of RQ to $\dot{V}O_2$ during work provided no reliable basis for prediction of max. $\dot{V}O_2$.

A64-81018

PLASMA AND RED CELL VOLUME AFTER PROLONGED SEVERE EXERCISE.

Per-Olof Åstrand and Bengt Saltin (Kungliga Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 829-832. 25 refs.
 Karolinska Inst. Reservations anslag; Sveriges Riksidrottsförbund (Swedish Sports Federation); and Försvarsmed, nämnden.

On six subjects plasma volume (Evans blue space) was determined before and 1 hour after an 85-km race in cross-country skiing. The total water loss during the 5- to 9.5-hour competition was estimated to be 5.9 liters, and at the time of measuring the reduction in body weight was 3.9 kg. or 5.5% of the weight. The plasma volume was increased 0.41 or 11% (0.01 > P > 0.001). A similar study was undertaken with measurements of red cell volume (Cr_{51}) on five subjects. The decrease in red cell volume was 0.081 or 3.2%. These findings are discussed in light of the small reduction in aerobic work

capacity in combination with a marked decrease in total work output after the race. In five workers in a steel mill (three at a hot bank and two at a smelting furnace) the total water loss during an 8-hr. shift in a hot environment was 3.9 liters and the reduction in body weight was 1.1 kg. or 1.9% of the weight. The blood volume (^{131}I) was increased by 0.23 liters or 3.5%.

A64-81019

LUNG VOLUMES AND BREATHING PATTERNS IN WIND-INSTRUMENT PLAYERS.

Arend Bouhuys (U. Hosp., Lab. of Clin. Physiol., Leiden, Netherlands; and Emory U., School of Med., Depts. of Med. and Physiol., Atlanta, Ga.)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 967-975. 26 refs.
 Prins Bernhard Fund, Amsterdam, Netherlands; and Nat. Tuberculosis Assoc.-Am. Thoracic Society, New York City supported research.

Pulmonary function at rest and physiological performance during play were studied in 42 professional wind players on 15 different instruments. Vital capacity was larger than expected from age and height in all brass players. Other lung function results were similar to or better than those in control subjects. Breathing patterns are qualitatively similar in players of nearly all instruments; rapid and deep inspirations are followed by prolonged expirations through the instrument. In some instruments nearly the whole vital capacity may be used during play. No gross changes in arterialized capillary blood pH, P_{CO_2} and standard bicarbonate content occurred during 1/2 hour's play. Mouth pressure on most instruments increased both with pitch and loudness and varied from 2.5 to 158 mm Hg. Air flow rates varied from less than 0.05 to over 1.6 liters/second. Performance on some, mainly brass, instruments is limited mechanically; on others, e.g., the oboe, breath-holding time is the limiting factor. Energy expended on the instrument (mouth pressure times the flow rate) ranged from less than 0.1 up to 17 w.

A64-81020

INFLUENCE OF GRAVITATIONAL FORCES ON FUNCTION OF LOWER EXTREMITY MUSCLES.

S. J. Houtz (Detroit Orthoped. Clin., Mich.)
Journal of Applied Physiology, vol. 19, Sep. 1964, p. 999-1004. 8 refs.
 Ford Found. and McGregor Fund supported research.

Action potentials were recorded by surface electrodes from the quadriceps, hamstrings, tibialis anterior, and triceps surae muscle groups as 12 normal adolescents performed a series of changes in posture. Postural movements consisted of sitting, standing, squatting, sit-ups, unilateral standing with contralateral lower extremity exercise, trunk forward bending with knee flexion and extension, and the headstand. Photographs were taken to assist in analyzing change in body position during the activities. The hamstrings and triceps surae resist forces tending to flex the supporting extremity when the trunk or contralateral limb is suspended anteriorly. The quadriceps and tibialis anterior act voluntarily or by lengthening contraction to move the body vertically. The muscles participating in an activity and their specific functions are influenced by gravitational forces, the weight and position of various body segments, and the point of contact with the supporting surface.

A64-81021

RADIOTELEMETRY IN THE STUDY OF EVACUATORY FUNCTION OF THE STOMACH (PRIMENIE RADIOTELEMETRII Dlya ISSLED VANIIA EVA-KUATORNOI FUNKTSII ZHELUDKA).

E. B. Babskii, A. S. Belousov, I. I. Malkiman, A. P. Nosterova, and A. S. Sorin (Akad. Med. nauk SSSR, Inst. Normal'n. i Patol. Fiziol.; and Tsentr. Inst. Usoversh. Vrachei, Vtoraiia Terapevt. Klin., Moskva).
Doklady Akademii nauk SSSR, vol. 156, May 1964, p. 719-720. In Russian.

A radiocapsule attached to the end of a fine duodenal tube, introduced into the gastrointestinal tract of a subject, was used to measure the pH changes of the duodenal contents. Prime tracings monitored by a radioteleceiver registered an abrupt rise in pH at the moment of the capsule's passage through the pylorus into the proximal end of the duodenum. When the capsule was maintained at a fixed point in the duodenum, the readings stabilized at pH 8.0 to 8.5. During sustained fasting the pH fell periodically to between 4 and 6, when highly acid gastric contents entered the duodenum. After a test meal, consisting of 50 g of white bread and 400 ml of boiled water, the duodenal contents remained alkaline during the first 30 to 40 minutes. After this period the acid fluctuated between pH 2 and pH 8, at a rhythm of 10 seconds to 1 minute, for a period of 30 to 90 minutes. Samples of duodenal contents withdrawn at this period showed a definite acid reaction. In the next few hours the duodenal pH readings showed a steady pH in the 7.0 to 8.0 range.

A64-81022

A RADIOTELEMETRIC STUDY OF THE PH IN THE DIGESTIVE TRACT (RADIOTELEMETRICHES-KOE ISSLEDOVANIE PH V PISHCHEVARITEL'-NOM TRAKTE).

E. B. Babskii, A. M. Sorin, A. S. Belousov, I. I. Malkiman, and A. P. Nesterova (Akad. Med. nauk SSSR, Inst. Normal'n. i Patol. Fiziol.; and Tsentr. Inst. Usoversh. Vrachei, Vtoraiia Terapevt. Klin., Moskva).
Doklady Akademii nauk SSSR, vol. 156, May-Jun. 1964, p. 222-224. 5 refs. In Russian.

A64-81023

A detailed description of a gastrointestinal radiocapsule for telemetric determination of hydrogen ion concentration of gastric contents is given. The sensor employed consists of an electrode couple, either of the antimony-silver chloride or glass-silver chloride type. Acidity variations from pH 1 to pH 9 are equivalent to a 0.05 to 0.5 range of difference of potential. A semiconductor triode or diode modulates the generated impulses. The range of resolution of the capsule is equal to pH 0.1 to pH 0.2. The radio signals from the sensor are received by an antenna mounted on a silk belt worn by the subject. The impulses are amplified and modulated by a radio receiver. A comparative study of potentials and of the biochemical method of pH determination of the extracted contents indicated consistency in coordination of readings. The radiocapsule can be used either as a free-moving unit, or it can be attached to the end of a fine gastric tube.

A64-81023

ON THE FUNCTIONAL STATE OF THE ORGAN OF EQUILIBRIUM IN WHITE MICE GROWN UNDER CONDITIONS OF DAILY ACCELERATIONS (O FUNKTSIONAL'NOM SOSTOIANII ORGANA RAVNOVESIIA U BELYKH KRYS, VYRASHCHENNYKH V USLOVIIAKH EZHEDNEVNOGO DEISTVIYA USKORENII).

A. A. Giurdzhan and Z. L. Apanasenko.

Doklady Akademii nauk SSSR, vol. 156, May-Jun. 1964, p. 225-227. 5 refs. In Russian.

Two to three day old rats placed in a cage resting on a rotation table, were subjected to radial acceleration at 33 r.p.m. for 4 to 5 hours each day, during a period of 2 to 3 months. Electromyograms of the resting muscles of the lower extremities, taken at the end of this period, showed a 50% decrease in amplitude and frequency. When the animals were subjected to swinging action at a frequency of 0.6 c.p.s., for 10 seconds and a maximum angle of 25°, the electromyogram registered a lowered response to vestibular stimulation—about 40% of normal values. Responses were delayed and terminated faster, as compared to controls. The relationship of the degree of vestibular stimulation response and muscle action in the experimental animals was not statistically different from that of the controls. The only conclusion which may be drawn from these experiments is that daily exposure of a growing organism to radial acceleration results in an increased functional capacity of the vestibular apparatus.

A64-81024

THRESHOLDS OF CALORIC NYSTAGMUS DURING ROTATION AT CONSTANT VELOCITY (POROGI KALORICHESKOGO NISTAGMA VO VREMIA VRASHCHENIIA S POSTOIANNOI SKOROST'IU).

I. V. Orlov (Akad. nauk SSSR, Inst. Fiziol. Im. I. P. Pavlova, Moscow).

Doklady Akademii nauk SSSR, vol. 156, Jun. 1964, p. 972-981. 18 refs. In Russian.

Pigeons were subjected to constant radial acceleration on a rotation table with their heads attached securely in a vise. The right horizontal semicircular canal of the bird was stimulated by a nichrome loop heated by an electric current. The temperature of the external wall of the canal was taken as a zero point. The degree of nystagmus was registered by a needle electrode inserted into the left lateral flexor of the neck. When the pigeon's head was in the center of the table, a lowering of the caloric nystagmus threshold was observed at a speed above 33 r.p.m. However, when the head was placed 20 cm from the center, the same effect was observed at 21 r.p.m. and 28 r.p.m. The radial acceleration effect on the vestibular apparatus at 33 r.p.m. may be due to the existence of a slight centrifugal force produced when the center of rotation falls between the labyrinths. The distance of 20 cm gives a radius sufficient to produce 0.1 to 0.2g, which causes the same effect at 21 to 28 r.p.m.

A64-81025

SEARCHING FOR FOOTPRINTS OF LIFE (W POSZUKIWANIU SLADOW ZYCIJA).

Monika Burde.

Astronautyka, vol. 7, 1964, p. 16-18. In Polish.

There is no evidence that life must rest on carbon protein alone. The ignorance of that problem, however, compels us to search for footprints of life on other celestial bodies in the form of protein. Terrestrial experiences show that living organisms—that is, the proteins which constitute the essential ingredient—can withstand extreme physical conditions we expect to exist on celestial bodies nearest the earth. At present, there are several designs for instruments to detect proteins on those bodies, such as Multivator, Gulliver, Wolftrap, and others. It would be advisable, however, to consider possibilities of improving these devices and applying modern devices for automatic chemical analysis, as well as to examine whether it is possible to use living tissues.

A64-81026

THE CONFLICT OF TWO WORLDS OF LIVING ORGANISMS (KONFLIKT ZYWYCH SWIATOW).

Mieczyslaw Markus.

Astronautyka, vol. 7, 1964, p. 21-22. In Polish.

Flights to other planets are connected with the possibility of meeting other living forms, especially microorganisms, and with the probable development of diseases dangerous to human subjects. The development of diseases is dangerous only in cases of meeting extraterrestrial microorganisms capable

of being human parasites. Theoretically, such situations will seldom occur. The author gives a review of such possibilities and analyses situations in which extraterrestrial microorganisms might be dangerous to cosmonauts.

A64-81027

EVOKESED RESPONSES FROM THE AUDITORY CORTEX.

Donald C. Teas and Nelson Y.-s. Kiang (Mass. Inst. of Tech., Res. Lab. of Electron., Center for Commun. Sci., Cambridge; and Mass. Eye and Ear Infirmary, Eaton-Peabody Lab. of Auditory Physiol., Boston).

Experimental Neurology, vol. 10, Aug. 1964, p. 91-119. 34 refs.

Grants No. NSG-496; NIH-G-MH-04737-03; NIH-G-B-1344; and NSF-G-16528. U.S. Army, AFOSR, and ONR supported research.

Evoked responses were recorded from the auditory cortex of unanesthetized cats. With clicks of moderate intensity, the waveforms of the responses were highly repeatable among awake cats. Localized injury to cortex, anesthesia, or sleep resulted in more or less characteristic changes in the waveform of the evoked responses. In particular, the later components of the responses seemed to be more sensitive to changes in the state of the animal, while the early components seemed to be abolished by local injury to the cortex. The evoked responses and particularly the later components did not always behave in a reliably repeatable fashion as click intensity or click rate was changed. When broadband background noise was introduced, the click evoked responses always showed a characteristic decrease in the earliest component. The later components were not substantially affected until the noise was raised to an intensity that was sufficient to mask the click for a listener. These results are interpreted in terms of multiple projection pathways to cortex with possible functional significance.

A64-81028

EFFECTS OF VIGILANCE AND OTHER FACTORS ON NONSPECIFIC ACOUSTIC RESPONSES IN THE RABBIT.

Carlos Beyer and Charles H. Sawyer (Calif. U., School of Med., and Brain Res. Inst., Dept. of Anat., Los Angeles).

Experimental Neurology, vol. 10, Aug. 1964, p. 156-169. 18 refs.

Grant No. PHS-G-B1162. Ford Found. supported research.

Auditory potentials evoked in response to click stimulation were recorded from a wide area of the brain in nine rabbits. The resulting averaged nonspecific acoustic responses (NSAR) showed great variability related to a variety of factors including the animal's state of alertness. During active wakefulness and paradoxical sleep the NSAR were greatly reduced as compared with those recorded in relaxed or drowsy animals. Generally, depression of the responses was associated with an aroused electroencephalogram (EEG), though important exceptions were noted. Movement was found consistently to depress the NSAR or even to suppress them completely. It is suggested that movement per se may play an important role in determining the amplitude and topographical distribution of NSAR. In some animals, the first click of a series elicited a large evoked potential which was correlated with the appearance of an orienting response. This potential became rapidly habituated. The NSAR did not become habituated even after very long periods of repetition of the click.

A64-81029

PoISONING OF THE RAT BY HYDRAZINE AND ALKYLHYDRAZINES.

R. D. O'Brien, M. Kirkpatrick, and P. S. Miller (Cornell U., Dept. of Entomol., Ithaca, N.Y.)

Toxicology and Applied Pharmacology, vol. 6, Jul. 1964, p. 371-377. 7 refs.

DOD supported research.

The mode of lethal action of hydrazine involves depression, whereas that of unsymmetrical dimethylhydrazine (UDMH) and monomethylhydrazine (MMH) involves convulsions. Pyridoxine antagonizes UDMH and MMH poisoning equally, but is somewhat less effective for hydrazine. Pyridoxal weakly synergizes UDMH and MMH poisoning, but weakly antagonizes hydrazine poisoning. Hydrazine, UDMH, MMH, and the nontoxic symmetrical dimethylhydrazine (SDM) all elevate blood glucose profoundly, with SDMH the effect is transient.

A64-81030

"SOLAR STILL".

H. Harbour.

Journal of Royal Naval Medical Service, vol. 50, 1964, p. 30-33.

A solar still for recovery of potable water, which could be utilized by aircrew survivors landing on a body of saline water, is made in the form of a small black bag enclosed in a polythene envelope. For use, the bag is removed from the envelope to permit thorough moistening of the drain cloth at the bottom of the still, then replaced. The bag can be inflated orally bellows, enclosed in survivor's kit. The sea water poured into the bag is subjected to solar radiation. By raising the bag temperature, the water is caused to evaporate into the polythene envelope. Upon contact with cool inner walls the vapor condenses forming droplets, which run down the sides of the envelope into a collecting bag. The system has shown good performance in the hands of experienced operators. However, actual trials indicated difficulties in following the closed instructions and, at best, gave poor yields.

A64-81031

CIRCULATORY STUDIES ON HEALTHY OLD MEN: WITH SPECIAL REFERENCE TO THE LIMITATION OF THE MAXIMAL PHYSICAL WORKING CAPACITY.

Tore Strandell (Karolinska sjukhuset, Dept. of Clin. Physiol., Stockholm, Sweden).

Acta Medica Scandinavica, Supplementum 414, vol. 175, 1964, 9+44 p.

96 refs.

In the supine position, older men showed a larger heart volume, a lower stroke volume, and a decreased cardiac output, as compared with younger individuals. Their blood circulation was hypokinetic. Increase in pulmonary flow resistance was equivalent to cardiac output decrease, resulting in an unchanged pressure drop over the peripheral pulmonary vessels. An increase in blood pressure and decrease in stroke volume indicated rigidity of vascular walls. During exercise, ventricular and supraventricular ectopic beats, and a ST depression were noted, indicating coronary insufficiency. High lactate concentration was recorded. The increase in pulmonary circulation was even more pronounced. Maximal oxygen intake, and maximal heart rate were decreased. It is suggested that the maximal physical capacity in older men depends on the peripheral rather than central blood circulation.

A64-81032

RECORDING OF EYE MOVEMENTS AS A CONTRIBUTION TO THE INVESTIGATION OF VISUAL ACUITY FOR MOVING OBJECTS [REGISTRIERUNG VON AUGENBEWEGUNGEN ALS BEITRAG ZUR UNTERSUCHUNG DER SEHSCHARFE FÜR BEWEGTE OBJEKTE].

Heinrich Honegger and Wolf Dieter Schäfer (Augenklinik U., Heidelberg, Germany).

Albrecht von Graefes Archiv für Ophthalmologie, vol. 166, 1964, p. 601-616.

28 refs.

Eye movements were traced by means of a light ray reflected from a mirror fastened by means of a suction cup on one eye. The other eye executed (a) horizontal movements of the saccadic type with fixation and interfixation pauses and of the pursuit type, and (b) circular movements of the saccadic and pursuit type. The different types of movement are described in detail. Inexactness observed in the performance of the movement seems to be related to the intricate balance among all eye muscles. With increasing speed, circular pursuit movements become increasingly inaccurate until they deteriorate into saccadic jumps at a speed at which the visual signal is barely recognizable. The lack of exactness in execution of eye movements may be one of the more important limiting factors in recognition of moving objects.

A64-81033

INVESTIGATIONS ON VISUAL ACUITY FOR MOVING OBJECTS. I. THE EFFECTS OF EYE DISEASES ON VISUAL ACUITY FOR MOVING OBJECTS [UNTERSUCHUNGEN ÜBER SEHSCHARFE FÜR BEWEGTE OBJEKTE. I. DER EINFLUSS VON AUGENKRANKHEITEN AUF DIE SEHSCHARFE FÜR BEWEGTE OBJEKTE].

Wolfgang Jaeger and Heinrich Honegger (Heidelberg U., U.-Augenklin., Germany).

Albrecht von Graefes Archiv für Ophthalmologie, vol. 166, 1964, p. 583-600.

10 refs.

Visual acuity for moving objects was studied by means of an apparatus projecting letters and numbers on a screen moving perpendicularly to the visual axis. Visual acuity decreases with increasing speed of the object. The normal curve was obtained from 120 subjects with normal vision and compared to those obtained from subjects with various visual anomalies. Visual acuity for moving objects relative to visual acuity at rest is lowered in advanced age, ring scotoma, concentric losses of the visual field, hemianopsia with a vertical division between the lost and preserved areas of the visual field, and oculomotor incoordination particularly in multiple sclerosis. It is increased relative to visual acuity at rest in uncorrected errors of refraction (myopia, hyperopia), central scotoma, and paresis of individual eye muscles. Absolute improvement of visual acuity for objects in motion over that of the normal individuals occurs in congenital nystagmus. In aphakia visual acuity for moving objects corresponds to the normal, taking into account the age factor. These results are discussed in relation to traffic problems.

A64-81034

BIOASTRONAUTIC RESEARCH: INTERDISCIPLINARY APPROACH.

Richard J. Preston (United Aircraft Corp., Hamilton Standard Div., Biosci. and Technol. Dept., Windsor Locks, Conn.)

Archives of Environmental Health, vol. 9, Sep. 1964, p. 292-297.

Difficulties involved in setting up research program teams of people, each of whom is versed in a separate specialty, in academic institutions and in industry are discussed. Descriptions and discussions of the operation of such an interdisciplinary approach to bioastronautic research in industry are presented. Teams to attack basic problems are made up of medical doctors, physiologists, psychologists, biological specialists, mathematicians, physicists, chemists, and mechanical, electrical, and systems engineers. Pictorial representations of the pyramid of organizational development and of a stimulator being developed for primate behavioral pattern studies are presented. Facilities of the highly specialized laboratory are described.

A64-81035

BIOCYBERNETICS.

Gordon B. Thomas (United Aircraft Corp., Hamilton Standard Div., Biosci. and Technol. Dept., Windsor Locks, Conn.)

Archives of Environmental Health, vol. 9, Sep. 1964, p. 298-302.

A discussion is presented of the ideas and usefulness of mathematical analysis of biological systems. The use of cybernetics is illustrated by the development of a model of the cardiovascular system. This would be used to predict cardiovascular functions during and after a manned space mission. The dynamics of calcium metabolism are discussed in relation to space flight, and data gathered on calcium metabolism during two Mercury flights are analyzed. A model of calcium dynamics is formulated and the problem of calcium loss is discussed.

A64-81036

DEVELOPMENTS IN PHOTOSYNTHESIS.

Sherwood C. Lewis (United Aircraft Corp., Hamilton Standard Div., Biosci. and Technol., Space and Life Systems Dept., Windsor Locks, Conn.)

Archives of Environmental Health, vol. 9, Sep. 1964, p. 308-309.

A brief review is presented of the major processes in photosynthesis. Differences between bacterial photosynthesis and that found in green plants are discussed. Processes of photosynthetic phosphorylation and adenosine triphosphate production in green plants are reviewed.

A64-81037

CONCEPTS OF ATMOSPHERE CONTROL IN SUBMARINES.

James E. Stark.

Archives of Environmental Health, vol. 9, Sep. 1964, p. 315-319.

28 refs.

The various means of controlling the atmosphere within a nuclear submarine are outlined. The most important aspect of control is stated to be the prevention of entry of toxic materials into the environment. The second and next in importance is the control of activities and processes within the environment so as to minimize production of toxic materials. The third is the combined processes of detection and measurement of the toxic materials. The fourth, but not least important, is the removal, conversion, or destruction of the toxic materials. Discussion of needs for continued study and the establishment of maximum allowable concentrations for the unusual conditions in submarines is included.

A64-81038

HUMAN RESPONSES TO HEAT STRESS.

Paul E. Smith and Edward W. James II (E. I. duPont de Nemours and Co., Haskell Lab. and Eng. Dept., Wilmington, Del.)

Archives of Environmental Health, vol. 9, Sep. 1964, p. 332-342.

9 refs.

A mathematical model of the human heat transfer system is explained, and programmed for analog simulation. The model is based on factors of heat generation, body insulation, blood circulation, and heat transfer. These parameters are analyzed in detail. Characteristics such as convection, skin temperature, heart rate, sweating, exercise, posture, etc. are taken into consideration. A validation program for the parameters was done and computer values were checked with laboratory data. A proposed thermoregulation model is shown and discussed.

A64-81039

ANALYSIS OF SIGNALS FROM INTACT NERVE.

Nils A. Normann and James U. Casby (United Aircraft Corp., Hamilton Standard Div., Biosci. and Technol. Dept., Windsor Locks, Conn.)

Archives of Environmental Health, vol. 9, Sep. 1964, p. 303-307.

A cybernetic analysis of nerve activity is presented in the light of developing biological control systems. The basic features of automatic control systems in general are reviewed. An analogy to physiological control systems is made. The principle of computing by cross-correlation for getting information of electrical activity in intact nerves is explained. A correlogram is ultimately produced which will show the activity and involvement of efferent and afferent nerves. Low voltage signals can also be detected, and quantitative involvement of groups of fibers can be made. In recording from several nerves at the same time, input and output from the central nervous system can be monitored, and, as in the case of the cardiovascular system, this will elucidate the operation of the regulatory centers.

A64-81040

THE TIME-INTENSITY RELATION IN VISUAL PERCEPTION AS A FUNCTION OF OBSERVER'S TASK.

Daniel Kahneman and Joel Norman (Hebrew U., Jerusalem, Israel).

Journal of Experimental Psychology, vol. 68, Sep. 1964, p. 215-220.

21 refs.

The duration-intensity relationship was investigated for a task in which triads of digits were to be identified. Critical durations (t_c) of 200 to 350 msec. were found for five subjects. Under identical stimulus conditions t_c for subjective brightness, determined by a matching method, was about 100 msec. for two of the subjects. It is concluded that t_c varies as a function of perceptual task and that it does not represent the duration of an early "sensory" phase of the visual process.

A64-81041

EFFECTS OF CONTROLLED AND UNCONTROLLED RESPIRATION ON THE CONDITIONED HEART RATE RESPONSE IN HUMANS.
Donald M. Wood and Paul A. Obrist (N.C. U., Med. School, Chapel Hill).
Journal of Experimental Psychology, vol. 68, Sep. 1964, p. 221-229. 15 refs.
Grants No. NIH-G-M-6020-A; and NIH-G-MH-07995. U. of N.C. supported research

A study was conducted to determine whether respiration amplitude increases during the conditioning of the heart rate and then whether such increases influence the biphasic heart rate response. Twenty-one human male subjects were conditioned using differential procedures, first without respiration control, then with respiration control. The latter method involved maintaining subject's normal frequency and depth of respiration. The biphasic acceleration-deceleration of heart rate was observed when respiration was not controlled. Respiration amplitude was significantly increased during the acceleratory period and the amplitude of the respiratory change was directly correlated with the amount of heart rate acceleration. When respiration was controlled, the acceleratory component was no longer found while the deceleratory component of the response was unchanged.

A64-81042

INFLUENCE ON EXTREME PERIPHERAL VISION OF ATTENTION TO A VISUAL OR AUDITORY TASK.

Robert G. Webster and George M. Haslerud (N.H. U., Durham).
Journal of Experimental Psychology, vol. 68, Sep. 1964, p. 269-272. 8 refs.

In contrast to previous studies which investigated competition of two or more tasks at the center of attention, this research examined the effects of competition between tasks at the periphery and center of attention. The apparatus was a perimeter having a radius of 30 in., and subjects were 32 male students. The results showed that both auditory and foveal counting tasks had equally significant detrimental effects on both the number of responses ($p < .05$) and reaction time ($p < .01$) to peripheral lights. In contrast, the counting tasks were almost 100% accurate. The fact that only the peripheral variable is inhibited gives another way of measuring the effects of attention, and the equality of detrimental effects suggests need for a redefinition of attention.

A64-81043

CHANGES IN TWO EEG RHYTHMS DURING MENTAL ACTIVITY.

Murray Glanzer (New York U., N.Y.), Robert M. Chapman, William H. Clark, and Henry R. Bragdon (Walter Reed Army Inst. of Res., Washington, D.C.).
Journal of Experimental Psychology, vol. 68, Sep. 1964, p. 273-283. 18 refs.
Contract No. DA-49-007-MD-1004; Grant No. NIH-G-NB-03590-02.

Two sets of tasks—mental addition tasks and concept tasks—were given to twelve subjects and the effects of these tasks on two electroencephalographic rhythms—kappa and alpha—were observed. On the mental addition tasks, the difficulty of the task was shown to increase the output of kappa significantly but not the output of alpha. On the concept task, however, the difficulty of the task was shown to depress the output of alpha significantly. The results for kappa, although highly consistent for each individual, did not show any consistent pattern from one individual to another. It is suggested that the effects of mental tasks on kappa and alpha are specific to the sense modality involved in the task.

A64-81044

RECENT SPACE PROBE AND EARTH-BASED STUDIES OF MARS AND VENUS.

P. Thaddeus (Inst. for Space Studies, New York, N.Y.).
Journal of the British Interplanetary Society, vol. 19, May-Jun. 1964, p. 419-428. 21 refs.

The results of recent astronomical observations of the atmosphere of Venus are reviewed and the models advanced to explain the high surface temperatures are discussed. The history of the Mariner space probe program is outlined and an account is given of the flight of Mariner II to Venus and of the observations made, which showed that the planet has no radiation belts, confirmed the high surface temperatures, and supported the greenhouse model of the atmosphere. Information about the atmosphere of Mars is also reviewed and proposals for a future Mariner flight to Mars are mentioned.

A64-81045

BALLISTIC STUDIES IN EYE PROTECTION.

Richard L. Williams and George M. Stewart (U.S. Army Chem. Res. and Develop. Labs., Edgewood Arsenal, Md.).
American Journal of Ophthalmology, vol. 58, Sep. 1964, p. 453-464. 7 refs.

Lead and steel BB's were fired at rabbit eyes and five types of optical lenses at a range of velocities from 40 ft./sec. to 611 ft./sec. Each type of missile, at comparable velocities, produced fracture patterns that were somewhat different from lens type to lens type but were similar for lenses of the same type. Fractures ranged from slight to extensive and fragments varied from minute splinters to large jagged pieces. In only 58.8% of lenses tested did the ballistic limit increase with increase in lens thickness. Ballistic limits were lower for lenses tested against the steel BB than for those tested against the lead BB. In 72% of the tests the 9.0-diopter lenses offered more resistance to

both missiles than did the 12-diopter lenses. Plastic lenses offered more resistance to these missiles, with the exception of five groups of heat-treated lenses, than did the glass lenses. Partial penetration impacts on the eye caused scars on the cornea and distortion and tearing of the iris. Complete penetrations perforated the cornea, damaged the lens, tore the iris, forcibly expelled fluids from the eye, and displaced the retina. It can be said that the eye armor is a definite asset to the protection of eyes and any optically suitable material possessing encouraging ballistic properties, such as plastic CR39, could be considered a valid candidate for such purposes.

A64-81046

PENTABORANE INTOXICATION.

Gordon Mindrum (Gen. Elec. Co., Cincinnati, Ohio).

Archives of Internal Medicine, vol. 114, Sep. 1964, p. 364-374. 16 refs.

Pentaborane is an extremely toxic chemical which produced many subjective neurologic complaints at low levels of intoxication, and after severe exposure caused many bizarre signs and symptoms including convulsions. The diagnosis was facilitated by a careful baseline examination and an intimate knowledge of the personality of the man. The history of exposure to the odor of pentaborane, plus the unusual subjective complaints, along with subtle changes in the personality or the signs of more severe involvement, combined to make the diagnosis of intoxication. The abnormal electroencephalogram which later reverted to normal confirmed the diagnosis. Treatment was entirely symptomatic and included rest, oxygen, and control of muscle spasm, pain, and convulsions.

A64-81047

SERIAL STUDIES ON THE METABOLISM OF HUMAN ADIPOSE TISSUE. II. EFFECTS OF CALORIC RESTRICTION AND REFEEDING ON LIPOGENESIS, AND THE UPTAKE AND RELEASE OF FREE FATTY ACIDS IN OBESE AND NONOBESE INDIVIDUALS.

R. B. Goldrick and Jules Hirsch (Rockefeller Inst., New York, N.Y.).

Journal of Clinical Investigation, vol. 43, Sep. 1964, p. 1793-1804. 25 refs.
Grants No. PHS-G-HE-06222-03 and PHS-G-HE-06222-02.

Several metabolic functions of adipose tissue were measured serially in obese and nonobese individuals during the course of caloric restriction and refeeding. Caloric restriction was shown to depress fatty acid uptake and esterification, virtually abolish fatty acid synthesis, and enhance free fatty acid (FFA) release from adipose tissue. Refeeding was associated with relatively slow restoration of fatty acid synthesis and esterification toward normal levels. Intravenous administration of glucose and insulin to starved obese individuals effected prompt inhibition of FFA release, slight restoration of fatty acid uptake and esterification but no change in fatty acid synthesis. During starvation and its rapid termination by glucose and insulin, variations in the rate of FFA release from adipose tissue were accompanied by parallel changes in the concentrations of plasma FFA.

A64-81048

METABOLISM OF GLUCOSE IN ANOXIC-ISCHAEMIC RAT BRAIN.

J. N. C. Atkinson and R. G. Spector (Guy's Hosp. Med. School, Pediat. Res. Unit, London, England).

British Journal of Experimental Pathology, vol. 45, Aug. 1964, p. 393-397. 11 refs.

Spastics Soc. supported research.

Unilateral anoxic-ischaemic brain lesions were produced in adult rats. The animals were killed 0 to 24 hours after the anoxic episode, having been injected with ^{14}C glucose-(U) 30 minutes beforehand. In both the anoxic-ischaemic lesions and normal areas of the brain most of the glucose was converted into amino acids, but there was an increase in alanine production in the cerebral lesions. In vitro, the post-anoxic brain tissue showed a decrease in glucose and oxygen consumption.

A64-81049

THE MEDICAL HELICOPTER AND THE GENEVA CONVENTION [L'HELI-COPTERE SANITAIRE ET LA CONVENTION DE GENEVE].

Robert Monnier.

Revue internationale des Services de Santé des Armées de Terre et de l'Air, vol. 36, Apr. 1963, p. 253-255. 10 refs. in French.

The importance of helicopters in evacuating the wounded and the demonstration of their efficiency as well as of their rentability during the wars in Indochina and Algeria make their massive utilization likely in the event of conflict. The author shows that the application of Article 36 of the 1st Geneva Convention ruins the special advantages in the use of helicopters. They must be protected everywhere, under all circumstances. It is thus necessary that the provisions of the Convention be more flexible. It is also advisable that the medical helicopters be permanently used by health officers, and exclusively for transporting the sick and the wounded, or medical supplies. It is imperative that the Medical Corps possess its own helicopter pilots, recruited from the administrative and health personnel of the active army and that it maintain its own fleet of helicopters. This would create a solid basis for discussing the revision of the Convention in order to grant the medical helicopter full protection.

A64-81050

AN AUTOMATIC DILUTION DEVICE AND ITS APPLICATION FOR ACHIEVING HOMOCONTINUOUS CHLORELLA CULTURES [EINE AUTOMATISCHE VEROUENNUNGSANLAGE UND IHRE ANWENDUNG ZUR ERZIFLUNG HO-MOKONTINUIERLICHER CHLORELLA-KULTUREN].

H. Senger (Tübingen U., Lehrstuhl für Chemische Pelanzenphysiol., Germany) and H. J. Wolf (Max Planck-Inst. für Biol., Abt. Weidel, Tübingen, Germany). Archiv für Mikrobiologie, vol. 48, 1964, p. 81-94. 28 refs. In German.

In order to obtain a continuous culture of *Chlorella pyrenoidosa*, it is necessary to keep the various factors constant which are involved in the growth process. The apparatus for algal cultures described by various authors allow maintenance of constant temperature, availability of CO₂ and supply of nutrient medium. The apparatus described in this paper provides additionally a constant supply of light per cell by means of a photocell controlled dilution of the algal cultures. By using opal-glass culture vessels a very constant level of density in the suspension is secured. The density of the culture, i.e. the available light per single cell, can be kept constant with an accuracy of + 4%. The percentual deviation of the average values of cell numbers, dry weight, and pigments were estimated over 4 days. Synchronized cultures were diluted in the described device and analyzed for some physical and chemical parameters.

A64-81051

INFLUENCE OF OXYGEN CONCENTRATION ON THE RATE OF PHOTOSYNTHESIS AND RESPIRATION OF ALGAE [VLIJANIE KONTSENTRATSII KISLORODA NA SKOROST' FOTOSINTEZA I DYKHANIIA VODNYKH RASTENII].

V. M. Kuturin, M. V. Ulubekova, and N. M. Nazarov (USSR Acad. of Sci., Inst. of Geochem. and Analytic Chem., Moscow). Doklady Akademii Nauk SSSR, vol. 157, 1964, p. 223-226. 8 refs. In Russian.

The results of experiments conducted on *Scenedesmus obliquus* at 22° C, on *Chlorella pyrenoidosa* at 39° C, and on *Eloëda canadensis* at 22° C indicated that the effect of oxygen on the observed rate of photosynthesis depends on the physiological state of the plant and the intensity of light. Algal respiration rate does not increase as a result of preliminary illumination. The respiration rate of algae in darkness is directly proportional to oxygen concentration, and differs from the respiration in light. It is doubtful whether the "true" rate of algal photosynthesis can be determined by the summation of the observed rates of photosynthesis and respiration in darkness.

A64-81052

B6 VITAMIN THERAPY IN EXPERIMENTAL LEAD AND BENZENE INTOXICATIONS [B6-VITAMINOTERAPII PRI EKSPERIMENTAL'NYKH INTOKSIKATSIIAHKH SVINTSOM I BENZOLOM].

G. M. Pokoilenko.

Farmakologija i Toksikologija, vol. 27, Jan.-Feb. 1964, p. 88-89. In Russian.

In rabbits, after induced benzene poisoning and ensuing leucopenia, pyridoxine caused an increase in the leucocyte count and a normalization of differential. As compared with untreated controls, a faster maturation of neutrophiles in the bone marrow was evident. In cases of lead poisoning, pyridoxine intake resulted in an increase of erythrocyte count and of hemoglobin content. Bone marrow hematopoiesis showed a decrease in the normoblast number and a corresponding increase of mature erythrocytes.

A64-81053

OPPOSITE EFFECTS OF ELECTROPHYSIOLOGIC DRIVING REACTION TO FREQUENT LIGHT FLASHES IN THE HUMAN BRAIN EXPOSED TO VESTIBULAR OR OPTOKINETIC STIMULI [PROTIPOLOZHNOE IZMENENIE ELEKTROFIZIOLOGICHESKOI REAKTSII USVOENIIA CHASTOTY SVETOVYKH MEL'KANII MOZGOM CHELOVEKA PRI VESTIBULARNYKH I OPTOKINETICHESKIKH RAZDRAZHENIYAKH].

V. G. Samsonova (USSR Acad. of Sci., Inst. of Higher Nervous Activity and Neurophysiol., Moscow).

Fiziologicheski Zhurnal SSSR, vol. 50, Jun. 1964, p. 649-654. 5 refs. In Russian.

A subject placed in a Barany chair, revolving at 1 to 18 r.p.m. was subjected to a continuous achromatic light flicker at 7 to 33 c.p.s. His electroencephalogram registered a decrease in the amplitude of flicker stimulus response, indicating a depressive effect of vestibular stimulation on the function of the optical brain centers. When the subject was in a stationary position observing a screen, which displayed a flowing linear design, moving at a rate of 1 to 2 per sec., a flicker of the same intensity produced an increase in the amplitude values. The conclusion could be drawn that vestibular stimulation and the excitation of the oculomotor system have a reciprocal effect on the visual centers of the brain.

A64-81054

LATENCY PERIOD OF MOTOR REACTIONS AND DEPRESSION OF THE ALPHA RHYTHM DURING MUSCULAR WORK, HYPERVENTILATION, AND BREATH-HOLDING [LATENTNYI PERIOD DVIGATEL'NYKH REAKTSII I DEPRESSIIA α -RITMA PRI MYSHECHNOI RABOTE, GIPERVENTILATII SII I ZADERZHKE DYKHANIIA].

M. P. Ivanova.

Fiziologicheski Zhurnal SSSR, vol. 50, Jun. 1964, p. 690-696. 13 refs. In Russian.

Studies of electromyograms and electroencephalograms of well trained athletes performing physical exercise (lifting 35 kg, barbells 40 to 45 times for a period of 50 sec.) led to the following conclusions: (1) When the individuals were employing maximal effort in performing the task, with ensuing brief hyper-ventilation and arrest of respiration, there was an increase in the latent period of motor function under conditions of light stimulus. The period of alpha rhythm depression was also increased. (2) When the subjects used little effort, the latent period of motor function was decreased, with simultaneous decrease in period of alpha rhythm depression. (3) During the recovery period, the readings taken 5, 10, 20 and 30 min. after the exercise, indicated that the latent motor function and the alpha rhythm depression fluctuate in phase.

A64-81055

ELECTROMYOGRAPHIC CHARACTERISTICS OF MUSCLE WORK WITH DIFFERENT LOADS AND RATES OF MOVEMENT IN HUMANS [ELETROMIOGRAFICHESKAIA KHAKARAKTERISTIKA RABOTY MYSHTS PRI RAZNYKH NAGRUZKAKH I SKOROSTIAHKH DVIZHENII CHELOVEKA]. Iu. Z. Zakharants (P. F. Lesgaft Inst. of Phys. Culture, Dept. of Physiol., Leningrad, USSR).

Fiziologicheski Zhurnal SSSR, vol. 50, Jun. 1964, p. 716-726. 14 refs.

In Russian.

In a study of rhythmic flexing and extending of an arm at the elbow and at the radial-carpal articulations, electromyogram findings led to the following conclusions: (1) Increase in movement speed and weight load resulted in higher amplitude up to a constant limit. (2) Regardless of stable coordination action of both antagonists, at an increase of speed and load, the distribution of the amount of work performed by each muscle varied. (3) At large loads and high speed of movements, regardless of complete mobilization and synchronization of activity of the neuromotor units, the amplitude of motor activity showed a drop. As a result, the body position changed and the muscle work load underwent adjustment in order to maintain a high speed of movements under heavy loads.

A64-81056

DIURNAL RHYTHM OF FUNCTIONS IN HUMANS DURING RESTRICTED MOBILITY [O SUTOCHNOM RITME FUNKTSII CHELOVEKA V USLOVIIAKH OGRANICHENNOI PODVIZHNOSTI].

N. E. Panferova.

Fiziologicheski Zhurnal SSSR, vol. 50, Jun. 1964, p. 741-749. 16 refs. In Russian.

The effect of prolonged muscular inactivity was studied on healthy young individuals either during a state of complete rest in a reclining chair for 2 to 10 days, or during free floating on the water surface for 1 to 11 days. The physiological function data taken every two hours during waking hours showed deviations from a normal daily rhythm of body functions. The body temperature rhythm was reversed. In the evening a rise in temperature was observed, instead of a fall, as noted in normally active individuals. Temperature fluctuations were irregular even in the same subjects during different days. Daily variations of pulse rate and maximal blood pressure were less pronounced than under normal activity. Variations in pulse rate and respiration did not coincide with the variations in temperature. The conclusion may be drawn that suppression of muscular activity has an overall depressive effect on physiological functions due to disturbances of the controlling factors of the autonomous nervous system.

A64-81057

METHOD FOR RECORDING SIMULTANEOUSLY RESPIRATORY MOVEMENTS AND SOUNDS OF SPEECH ON THE SAME MAGNETIC TAPE [METOD ODNOVREMENNOI REGISTRATSII DYKHATEL'NYKH DVIZHENII I ZVUKOV RECHI NA ODNOI MAGNITOFOONNOI LENTE].

V. P. Morozov (I. M. Sechenov Inst. of Evolutionary Physiol., Leningrad, USSR).

Fiziologicheski Zhurnal SSSR, vol. 50, Jun. 1964, p. 762-764. In Russian.

A miniature potentiometer with an alternating resistance of 760 ohms, and enclosed in a plastic box of 3.9 cm diameter is connected with a sensor attached to a tape, placed around the subject's thorax, and to a magnetophone. This unit is incorporated into a device for the synchronized study of chest movements and the intensity, spectrum, speed, and clarity of sound during speaking or singing exercises.

A64-81058

OXYGEN DEFICIENCY (SOME RESULTS AND TASKS OF INVESTIGATION) [PROBLEMA KISLORODNOI NEDOSTATOCHNOSTI (NEKOTORYE ITOGI I ZADACHI ISSLEDOVANII)].

I. R. Petrov (USSR Acad. of Med. Sci., Moscow).

Patologicheskaja Fiziologija i Eksperimental'naja Terapija, vol. 8, Jan.-Feb. 1964, p. 3-9. 21 refs. In Russian.

The author briefly cites some results of the work performed at the Chair of Pathological Physiology of the Military-Medical Academy for an almost 70-year period of the oxygen deficiency problem development; some results of investigations done at the laboratory of experimental pathology of the Leningrad Institute of Blood Transfusion are also presented. The results of investigations for the last 38 years are given in greater detail.

A64-81059

SOME REGULARITIES OF THE APPEARANCE OF ACCELERATION FEELINGS WHEN THE ACCELERATION OF GRAVITY IS BEING CHANGED [NEKOTORYE ZAKONOMERNOSTI VOZNIKNOVENIIA AKTSELERATSIONNYYKH OSHCHUSHCHENII PRI IZMENENII USKORENIIA SILY TIAZHESTI].

E. A. Derevianko and V. G. Mylnikov.

Voprosy Psichologii, vol. 1964, May-Jun, 1964, p. 131-139. In Russian.

The main reason for the appearance in man of acceleration feelings in a range of overload (0.8 to 1.2g) is the change of the value of the overload (gradient). When the meaning of the overload is established, this feeling disappears due to rapid adaptation of acceleration analyzers and appears again, when the overload is returned to 1.0g. It can be assumed that in real flight the minimum gradient, when acceleration feeling appears, is within the limits ±0.01 to 0.02 g/sec. The latent period of the appearance of the acceleration feeling is closely related with the gradient. This relation can be expressed by an equation. The gradient of the overload beginning from 0.01 to 0.02 g/sec. gives to the flyer adequate information about the beginning of the change of the position of the plane in space. However, due to the rapid adaptation of the acceleration analyzers, this information is additional to the visual information perceived by the flyer. The acceleration information appears to help the flyer choose the necessary speed and amplitude of movements in handling the control levers.

A64-81060

THE SPEED OF RESPONSES IN MAN AS AFFECTED BY THE TEMPO OF THE PRESENTATION OF ALTERNATIVE SIGNALS [ZAVISIMOST' SKOROSTI OTVETNYKH REAKTSII CHELOVEKA OT TEMPY PRED'IAVLENIIA ALTERNATIVNYKH SIGNALOV].

O. A. Konopkin.

Voprosy Psichologii, vol. 1964, Jan.-Feb. 1964, p. 45-60. 11 refs. In Russian.

Light flickers at the rate of 0.25 per second, flashed repetitively at different locations on the screen, were employed in testing the speed of perception and response to visual signals, in subjects who reacted by pressing a button. The results indicated that an increase in speed of signal presentation, within certain limits, stimulated the speed of response, without lowering the degree of accuracy. Extreme speed decreased the degree of accuracy of response. Verbal coaching and a set pattern of flickers led the subject to develop his own pattern of response which enhanced his speed and accuracy. These findings can be taken as evidence that perception of information may involve the conscious-voluntary mechanism of action.

A64-81061

CIRCULATORY RESPONSE TO HYPOXIA IN UNANESTHETIZED DOGS WITH AND WITHOUT CARDIAC DENERVATION.

Gerald Glick, William H. Plauth, Jr., and Eugene Braunwald (NIH, Nat. Heart Inst., Cardiol. Branch, Bethesda, Md.)

American Journal of Physiology, vol. 207, Oct. 1964, p. 753-758. 26 refs.

The generally held view that acute hypoxia stimulates the cardiovascular system was re-investigated in ten normal, trained, unanesthetized dogs and in six dogs which had previously been subjected to total cardiac denervation. In the normal dogs, no significant or consistent changes were noted in cardiac output, stroke volume index, or in systemic arterial pressure 5 and 15 min. after the onset of 8% O₂ inhalation. Heart rate, however, rose significantly. The dogs which had been subjected to cardiac denervation responded with small elevations of cardiac output and heart rate during the late hypoxic period. Thus, these findings are contrary to the classical concept that hypoxia elevates the cardiac output. Moreover, despite the absence of both the sympathetic and parasympathetic innervations of the heart, subjecting the denervated animals to severe hypoxia revealed that they were at no apparent hemodynamic disadvantage in comparison to the intact animals.

A64-81062

CAROTID SINUS DEPRESSOR REFLEXES DURING HYPOTHERMIA.

J. E. Kendrick and Kenneth A. Turner (Wis. U., Dept. of Physiol., Madison). *American Journal of Physiology*, vol. 207, Oct. 1964, p. 777-781. 12 refs. Grant NIH-H-4098, Wis. Alumni Res. Found. and Wis. Heart Assoc. supported research.

Reducing body temperature in dogs to 24° C caused a small reduction in the size of the carotid sinus depressor response. Along with this reduction the response also became more gradual at the lower body temperatures. Systematic studies demonstrated that the more gradual nature of the response appeared to result from changes in the vascular smooth muscle. Depression of the nervous elements of the baroreceptor reflex arc during hypothermia was not evident. The response to carotid sinus stimulation in the warm, perfused hindlimb was essentially unchanged by cooling the body to 24° C. Local cooling of the perfused hindleg did not reduce the size but did result in a more gradual response.

A64-81063

DIFFERENCES IN DISPLACEMENT OF RIBS AND COSTAL INTERSPACES IN RABBITS EXPOSED TO AIR SHOCK WAVES.

Carl-Johan Clemedson and Arne Jönsson (Res. Inst. of Nat. Defense, Biophys. Sect., Sundbyberg; and Gothenburg U., Dept. of Hygiene, Sweden).

American Journal of Physiology, vol. 207, Oct. 1964, p. 931-934. 15 refs.

The dynamic response of different parts of the chest wall of rabbits exposed to high-explosive shockwaves was recorded by means of a mechano-electric motion transducer. The costal interspaces were found to be displaced inward with a greater amplitude and in a shorter time than the parts containing the ribs. The correlation of the "rib markings" in lung blast injury to these differences in amplitude is discussed.

A64-81064

IMPORTANCE OF NORADRENALINE IN COLD ADAPTATION.

Jacques Leblanc and Marcel Pouliot (Laval U., School of Med., Dept. of Physiol., Quebec City, Canada).

American Journal of Physiology, vol. 207, Oct. 1964, p. 853-856. 15 refs. MRC of Canada supported research.

Noradrenaline (300mg/kg.) was injected daily for 45 days in a group of 15 rats. At the end of this period O₂ consumption and rectal temperature responses to noradrenaline (200mg/kg.) were measured at 30° C in these animals as well as in cold-acclimated and control groups. Noradrenaline-treated and cold-acclimated animals have a larger O₂ and rectal temperature increase than the control. At -20° C the noradrenaline-treated and cold-adapted rats maintained a higher rectal temperature and survived longer than the control group. These results indicate that repeated injections of noradrenaline to animals at room temperature can produce some cold acclimation and suggest that noradrenaline may be of importance in acclimation of rats exposed to cold.

A64-81065

BROWN AND WHITE ADIPOSE TISSUE METABOLISM IN COLD-EXPOSED RATS.

G. Steiner and G. F. Cahill, Jr. (Harvard Med. School, Dept. of Med., Cambridge, Mass., and New England Deaconess Hosp. and Diabetes Found., Inc., Elliott Joslin Res. Lab., Boston, Mass.)

American Journal of Physiology, vol. 207, Oct. 1964, p. 840-844. 20 refs. Grants PHS-G-AM-02640-05; PHS-G-TI-AM-5077; and PHS-G-HE-04569-04. Diabetes Found., Inc. supported research.

Brown and white adipose tissue from rats exposed to 5° C for 9 days has been studied with reference to its composition and handling of glucose-U-C¹⁴ in vivo and in vitro. Brown adipose tissue from cold-exposed rats demonstrated a decreased lipid content per milligram nitrogen, due mainly to decreased amounts of neutral lipid with little change in phospholipid. The incorporation of glucose into neutral lipids, glyceride glycerol, and fatty acids was increased in vivo and in vitro. There was increased incorporation into CO₂ in vitro and there was no change in glucose conversion to phospholipid in vivo. No changes in any of these were noted in epididymal fat pads. These findings suggest that cold exposure leads to alterations in carbohydrate metabolism and lipogenesis in brown adipose tissue but not in epididymal fat pads. The possible role in thermogenesis is discussed.

A64-81066

SUPRASPINAL MODULATION OF HETERONYMOUS MONOSYNAPTIC AND OF POLYSYNAPTIC REFLEXES DURING NATURAL SLEEP AND WAKEFULNESS.

S. Giacquinto, O. Pompeiano, and I. Somogyi (Centro di Neurofisiol. e Gruppo d'Elettrofisiol. del C.N.R., Pisa U., Ist. di Fisiol., Italy).

Archives Italiennes de Biologie, vol. 102, 1964, p. 245-281. 89 refs.

Grant PHS-G-NB-02990-02.

Spinal reflexes induced by electrical stimulation of muscle afferents were investigated during natural sleep and wakefulness in unrestrained, unanesthetized cats. The heteronymous extensor and flexor monosynaptic reflexes as well as the polysynaptic flexion reflex were studied. Both the heteronymous monosynaptic and the polysynaptic spinal reflexes were only slightly decreased during synchronized sleep, as compared with relaxed wakefulness. Parallel to a slight depression in spinal reflexes occurring during these experimental conditions, there was also a slight increase in threshold for the arousal. During desynchronized sleep there was complete abolition of the heteronymous monosynaptic extensor and flexor reflexes, and a striking depression also of the polysynaptic flexion reflex. This response actually appeared only as a symptom of a generalized motor response, which occurred only when stimulation of the flexion reflex afferents was so strong as to awake the animal. The threshold for this arousal was much higher during the desynchronized sleep episodes than during the synchronous phase of sleep. Abortive episodes of desynchronized sleep could be recognized by a transitory reduction or abolition of the heteronymous monosynaptic reflexes, in spite of the presence of some electromyogram activity in the posterior cervical muscles.

A64-81067

SPONTANEOUS ACTIVITY OF SINGLE VESTIBULAR NEURONS OF UNRESTRAINED CATS DURING SLEEP AND WAKEFULNESS.

E. Bizzì, O. Pompeiano, and I. Somogyi (Centro di Neurofisiol. e Gruppo d'Elettrofisiol. del C.N.R., Pisa U., Ist. di Fisiol., Italy).

Archives Italiennes de Biologie, vol. 102, 1964, p. 308-330. 84 refs.

Grant PHS-NB-02990-02.

Stereotaxic extracellular recording from single units in the vestibular complex was performed in unanesthetized, freely moving cats, to study the effects of natural sleep and waking on their spontaneous activity. Particular attention was devoted to changes occurring during sleep with electroencephalogram (EEG) slow waves and sleep with low voltage fast EEG activity. Changes occurring in the lateral vestibular (Deiters') nucleus, in the superior vestibular nucleus, and in the medial and descending vestibular nuclei are discussed. It is concluded that the abolition of the postural tonus occurring during desynchronized sleep is not due to withdrawal of tonic descending facilitatory influences originating from Deiters' nucleus. However, the increased activity of most of the units localized in the medial and descending vestibular nuclei as well as the neighboring reticular formation suggests that these structures might be either responsible for or related to the rapid eye movements that occur during desynchronized sleep. The origin of the patterning of discharge in these neurons during desynchronized sleep, however, remains to be determined.

A64-81068

SERUM-CHOLESTEROL AND CAPACITY FOR PHYSICAL WORK.
Sven Hernberg (Inst. of Occupational Health, Helsinki, Finland).

Lancet, vol. 2, Aug. 29, 1964, p. 441-443. 20 refs.

Helena Lundqvist Found, supported research.

In 892 businessmen, the serum-cholesterol level showed a negative correlation with the capacity for physical work in the 30 to 49 age group whereas there was no significant correlation in the 50 to 59 age group. Smoking did not notably affect the cholesterol level or the capacity for physical work.

A64-81069

ADENOSINE TRIPHOSPHATE AND COCARBOXYLASE IN TREATMENT OF MILD OR INITIAL FLYING FATIGUE IN PILOTS [SULL'IMPIEGO DELL'ACIDO ADENOSINTRIFOSFORICO E DELLA COCARBOSSILASI IN PILOTI AFFETTI DA LIEVE O INIZIALE FATICA DI VOLO].

G. Rotondo (Padova U., Ist. di Med. Legale e delle Assicurazioni, Padova, Italy; and Direzione di Sanita della 1A Regione Aerea, Milan, Italy).

Rivista di Medicina Aeronautica e Spaziale, vol. 27, Apr.-Jun. 1964, p. 176-197. 19 refs. In Italian.

Twenty jet pilots with mild or initial flight fatigue were treated with prolonged oral administration of a preparation containing adenosine triphosphate and carboxylase. Considerable improvement of the symptoms and operational efficiency were shown by almost all the subjects treated, encouraging more clinical experimentation. This treatment may be of use in the medicolegal area which is concerned with the prevention of aircraft accidents, maintaining physiological and mental efficiency of flight personnel, and rapid recovery from flight fatigue. Prompt and adequate treatment of mild and initial flight fatigue is necessary in order to prevent the evolution of forms which are more severe, and from which recovery is difficult. A review is included of the physiological and pharmacological mechanisms of adenosine triphosphate and co-carboxylase as used in the treatment of flight fatigue, considering the modern etiopathogenesis of this syndrome.

A64-81070

SERUM PROTEIN AND LIPID CHANGES IN NORMAL OLD AGE [LES TABLEAUX PROTEIQUE ET LIPIDIQUE DU SERUM DANS LA SENESCENCE NORMALE].

C. Franzini and C. Turri (L'Hôpital Majeur, Service de Med. Geriatrique, Novara, Italy).

Giornale di Gerontologia, vol. 12, Feb. 1964, p. 131-136. 18 refs. In Italian.

A tabulated comparison is made of the serum proteins and lipoproteins of 311 normal subjects over 70 years of age (143 males and 168 females), and normal subjects in the age groups of 20 to 49, 50 to 59, and 60 to 69 years, respectively. The most evident and significant changes in the aged were hypo-proteinemia, hypoalbuminemia, and hypo-beta-globulinemia. These changes were not only due to dietary restrictions among the poor or to improper diet, but to functional disorders related to faulty intestinal absorption, and to minor organic disorders. Total cholesterolemia and total lipidemia showed a tendency to decrease during aging. This decrease was related to improper metabolism of hormones, enzymes, and vitamins induced by age. Serum lipoproteins revealed no significant changes with relation to age. Differences were found in the behavior of serum lipid metabolism between the two sexes as a function of age.

A64-81071

RIGHT VENTRICLE DISCHARGE RATE AND CARDIOPULMONARY CIRCULATION TIMES IN HEALTHY AGED SUBJECTS. A RADIOCARDIOGRAPHIC INVESTIGATION.

R. Gallini, R. Masi, F. Grandonicco, M. Serio, and M. Legnaioli (Florence U., Clin. Med. Gen., Florence, Italy).

Giornale di Gerontologia, vol. 12, Feb. 1964, p. 217-220.

Radiographic studies after intravenous injections of ^{113}I labeled human serum albumin in adults and elderly individuals showed that: (1) right ventricular discharge force was significantly reduced only in subjects over 74 years of age; (2) ventricular systolic pressure did not decrease at basal conditions in subjects under 70; and (3) minimal pulmonary circulation time increased only in old persons, while medial and maximal time decreased significantly in healthy individuals between 50 and 74. The results indicate a gradual impairment of right ventricular discharge rate and pulmonary circulation.

A64-81072

AEROBIC WORK CAPACITY AND CIRCULATION AT EXERCISE IN MAN. Bengt Saltin (Kungl. Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).

Acta Physiologica Scandinavica, Supplementum 203, vol. 62, 1964, 5+52 p. 194 refs.

Med. Res. Council, Swedish Nat. Assoc. against Heart and Chest Diseases; Defense Med. Council; Swedish Sport Federation; Res. Council of Swedish Sport Federation; and Förenade Liv (United Life, Mutual Group Insurance Co.) supported research.

When large muscle groups are active for a period of time the aerobic processes are important in determining the potential capacity of each muscle for an uninterrupted performance. This review presents findings of many investigators on the analysis of the organism's adaptability to maximal work load under normal conditions, and after dehydration caused by an extended exercise or an exposure to high ambient temperatures. The effects on the blood circulatory system are discussed. The findings indicate that reduced aerobic work capacity may be excluded as an essential explanation of the gradual decrease in physical work capacity during dehydration of the organism. The actual mechanism should be sought at the cellular level.

A64-81073

FUNCTIONAL CORRELATIONS BETWEEN THE DIENCEPHALIC NYSTAGMOGENIC AREA (DNA) AND THE VESTIBULAR NYSTAGMOGENIC AREA (VNA).

Pierre Montandon (Geneva U., Oto-rhino-laryngol. Clinic, Geneva, Switzerland).

Acta Oto-Laryngologica, Supplementum 186, 1964, 5+38 p. 32 refs.

In rabbits immobilized in a normal position in a hammock, which was placed in a soundproof and totally dark cage, electrical stimuli of definite brain areas produced the following results: (1) stimulation of the diencephalic nystagmogenic area (DNA) and the contralateral vestibular nystagmogenic area (VNA) produced the same nystagmic response as physiological stimulation of the contralateral peripheral receptors; (2) stimulation of the DNA attenuated the response of the ipsilateral vestibular nuclei and increased the contralateral vestibular nuclei response; (3) destruction of the DNA produced disorganization of the nystagmic response and resulted in directional preponderance of nystagmus; and (4) the existence of a bilateral connection of the DNA and VNA was confirmed by histological studies.

A64-81074

ON THE LENGTH OF AXIS AND REFRACTORY INDEX OF EMMETROPIE LIVING EYES (UBER ACHSENLANGE UND BRECHKRAFT EMMETROPER, LEBENDER AUGEN).

H. Gernet (Hamburg U., U.-Augenklin. Hamburg-Eppendorf, Germany).

Albrecht von Graefes Archiv für Ophthalmologie, vol. 166, 1964, p. 424-431. 14 refs.

An echographic-optical method was used to study 120 living eyes with known emmetropic refraction and frontal corneal curvature with respect to the length of the optical axis. The average axial length amounted to less than 24 mm. In addition to considerable variability due to individual differences there was a statistically significant difference between males (23.3 mm.) and females (22.7 mm.). Application of simple optical laws permits certain conclusions. The theoretical refractive index of the unaccommodated emmetropic human eye is approximately 1.5. The total refraction of emmetropic living eyes is on the average higher than presumed (64.4 diopters for males; 66.3 diopters for women) and shows a statistically significant sex difference. The refractive power of the lens is also higher with a statistically significant difference between men (21.7 diopters) and women (22.9 diopters). The higher total refractive index of the female eye is based largely on the increased refraction power of the lens; the remainder is contributed by the greater curvature of the anterior corneal surface.

A64-81075

CALCULATION OF A THEORETICAL TOTAL REFRACTION INDEX IN THE UNACCOMMODATED LIVING EYE (ZUR BERECHNUNG EINES FIKTIVEN GESAMTBRECHUNGSINDEX AM AKKOMMODATIONLOSEN, LEBENDEN AUGE).

H. Gernet (Hamburg U., U.-Augenklin., Hamburg-Eppendorf, Germany).

Albrecht von Graefes Archiv für Ophthalmologie, vol. 166, 1964, p. 415-423. 14 refs.

A simplified theoretical model of the optical system of the eye is developed on the basis of the measurement of the length of the optical axis in the living eye with a combined optical-echographic method, the frontal corneal curvature, and the refractive index. This abstraction is valid only for an emmetropic unaccommodated living eye with the lens intact. The eye functions as a simple optical system in which the radius of the curvature between air and eye surface corresponds to the frontal corneal curvature and the length of the optical axis corresponds to the rear focal length. Using these values it is possible to calculate a theoretical total refractive index which allows assessment of the exact refractive power of an individual eye.

A64-81076

PROLONGING VISUAL AFTER IMAGES.

R. J. Hall (Philco, Aerotron Div., Washington, D.C.) and W. E. Wilsoncroft (Claremont Graduate School, Claremont, Calif.)
Psychonomic Science, vol. 1, Sep. 1964, p. 267-268. 8 refs. Hughes Aircraft Corp. supported research.
 Grant PHS-G-M-5207-3.

This study indicates that supplying stimulus changes (flickering on-off light) to the visual field following initial stimulation of the retina can prolong the duration of visual afterimages. Although most current research on after-images has focused on the biochemical and neural basis of this phenomenon, it is suggested that post-stimulation conditions in the visual field as well as such simple "changes" as blinking may also be significant parameters.

A64-81077

HEMODYNAMIC RESPONSES TO EXERCISE IN CLINICALLY NORMAL MIDDLE-AGED MEN AND IN THOSE WITH ANGINA PECTORIS.

Glenn L. Foster, T. Joseph Reeves, and James H. Meade, Jr. (Med. Coll. of Ala., Dept. of Med., Birmingham).
Journal of Clinical Investigation, vol. 43, Sep. 1964, p. 1758-1768. 22 refs.
 Grants PHS-G-HE-05080-04, and PHS-G-IIE-03684.

The hemodynamic responses to exercise in two groups of middle-aged men have been compared to each other and to those of young normal volunteers. One group, with a mean age of 47.4 years, was clinically normal; the other, with a mean age of 48.7 years, had classic angina pectoris but was not in congestive heart failure. There was no statistically significant reduction of the cardiac output, stroke volume, or mean rate of ejection in the middle-aged normal subjects as compared to the younger group. A well-marked reduction in each of these variables at comparable levels of exercise was found in the subjects with angina pectoris as compared to either of the two normal groups. The hemodynamic consequences of angina pectoris are therefore considerably different from those due to aging.

A64-81078

EMERGENCY SUPPLY-INITIAL SUPPORT FOR FLIGHT MEDICINE AND BIOENVIRONMENTAL ENGINEER.

Theodore H. Poe (USAF School of Aerospace Med., Clin. Sci., Div., Brooks AFB, Tex.)
Military Medicine, vol. 129, Sep. 1964, p. 845-847.

Amarillo Air Force Base, Texas, has designed and constructed a cabinet insert for a quarter-ton truck for "crash ambulance" service, which can transport quantities of medical supplies to the scene of an aircraft accident and still provide sufficient space for transporting patients. Constructed of sheet metal and plywood, the cabinet can be secured to the bed of the truck. Unscrewing of few bolts permits removing the cabinet when necessary. Brackets for two Stokes litters are provided on the roof, and a dome light is installed inside the cabinet. The equipment and medical supplies are maintained in a ready state. Trials by the Bioenvironmental Engineer showed the immediate availability of the unit and reduced reporting time at the time of emergency.

A64-81079

A STUDY OF CHANGES IN THE COCHLEAR MICROPHONIC POTENTIAL ARISING AFTER INTENSE AUDITORY STIMULATION (ETUDE DES MODIFICATIONS DU POTENTIEL MICROPHONIQUE COCHLEAIRE SURVENANT A LA SUITE DE STIMULATIONS SONORES INTENSES).

M. Burgeat and C. Burgeat-Menguy (Fac. de Med., Clin. O.R.L., Lab. d'oto-Neurol. Experimentale, Paris, France).
Journal de Physiologie, vol. 56, Mar.-Apr. 1964, p. 225-232. 7 refs.

In French.

Guinea pigs and gerbils were exposed to intense sound (5000 Hz, 300 decibels intensity) to induce auditory fatigue. A weaker sound (5000 Hz, 50 decibels intensity) was used to test the degree of fatigue. Electrodes placed in the tympanic area (guinea pigs) and vestibular area (gerbils) permitted the oscillographic registration of variations in the cochlear microphonic potential situated at the level of ciliated cells. Exposure to very intense sound caused a transitory decrease in the amplitude of the cochlear microphonic potential. This response was a function of the duration and intensity of intense sound. Transitory cochlear fatigue appeared to be related to biochemical changes at the level of the organ of Corti. Disappearance of the fatigue phenomenon after the animal's death, and its decrease during anoxia induced by breathing in a closed circuit, suggests that only a fraction of the microphonic potential which disappears rapidly during anoxia is susceptible to transitory acoustic fatigue (microphonic of first order). When this microphonic component decreases, the fatigue phenomenon decreases until it disappears entirely (microphonic of second order). The latter is not susceptible to this type of transitory acoustic fatigue.

A64-81080

ENVIRONMENTAL BIOPHYSICS AND MICROBIAL UBIQUITY.

J. R. Vainenyne (Cornell U., Dept. of Zool., Ithaca, N.Y.)
Annals of the New York Academy of Sciences, vol. 108, Jun. 29, 1963, p. 342-352. 57 refs.

The geocentric point of view limits the possibility of extraterrestrial life to conditions which are necessary for maintaining life on earth. Two assumptions

seem to be involved: (1) complete knowledge of environmental limits beyond which life is impossible and (2) these geoenvironmental limits are not exceeded on a cosmic scale. Studies of microorganism ecology show great variations of temperature, from -18° to 104° C. The range of environmental potentials varies from 850 mv. to -450 mv. The mean hydrogen concentration ranges between pH 1.0 and pH 10.2. Salinity tolerance may be as high as 25% NaCl. The range of hydrostatic pressure observed can be 0.1 atm, and reach 1,400 atm. Water is the most important factor in the life process, yet microorganisms can survive in a dehydrated state. There are various other factors, such as ionizing radiation, ultraviolet light, and partial pressure of various gases and of many chemical compounds, which may enhance or destroy growth and reproduction. As shown from the material presented, the degree of adaptability of living organisms is enormous. The question seems to be not so much one of adaptability of the living organism, as one concerning the origin of life itself.

A64-81081

IRON AS A FACTOR RESTRICTING THE GROWTH OF CHLORELLA IN THE TAMIYA NUTRITION SOLUTION (ZHELEZO KAK FAKTOR, LIMITIRUIVSHCHII ROST KHLORELLY NA SREDE TAMIYA).

E. D. Kuznetsov and M. G. Vladimirova (USSR Acad. of Sci., K. A. Timirazev Inst. of Plant Physiol., Moscow).
Fiziologija Rastenij, vol. 11, Jul.-Aug. 1964, p. 615-619. 15 refs. In Russian.

Chlorella pyrenoidosa was grown in a Tamiya medium containing a threefold concentration of iron salt, as compared with the standard formula (0.009 grams of FeSO₄·7H₂O per one liter of medium). The growth rate of the algae was observed at 26° to 28° C under constant illumination of 12,000 lux (meter-candles). The growth of algae during a growth cycle was increased by 635 to 774 million cells per milliliter. An increase in nitrate ion was necessary for this growth effect. An additional amount of a chelating agent, the ethylene-diamino-tetraacetate, or trace elements produced no effect on growth rate.

A64-81082

LOCAL CONDITIONED RESPONSES OF THE EVOKED POTENTIAL TYPE IN HUMAN EEG TO TWO PAIRED STIMULI (LOKAL'NYE USLOVNYE REAKTSII TIPO VYZVANNYKH POTENTSIALOV V ELEKTROTESEFALOGRAMME CHELOVEKA PRI SOCHETANIU DVUKH RAZDRAZHITEL'EJ).

L. M. Puchinskaja (USSR Acad. of Med. Sci., Burdenko Inst. of Neurosurg., Moscow).
Zhurnal Vysshhei Nervnoi Delatel'nosti, vol. 14, Jul.-Aug. 1964, p. 577-586. 12 refs. In Russian.

A study of human electroencephalogram responses at various areas of the brain to combined stimuli of sound and light showed the following results: (1) Nonspecific conditioned reflex potentials vary in character and in latent period. They may coincide with the nonspecific nonconditioned reflex, suppressing the specific response to a light stimulus. The areas of responses to sound and light may not coincide. (2) The specific response to a light stimulus in the posterior areas of the brain is either absent or feeble. (3) The conditioned reflex potentials evoked by combined sound and light stimuli appeared during the first day of the experiment, but reached a maximum only after several days. During maximal expression of these potentials, the specific response to light, which at the beginning of the experiment was optimal, was now very feeble. (4) Changes in stimulus pattern or sudden darkness resulted in more regular conditioned reflex potentials.

A64-81083

PRIMARY POTENTIALS EVOKED BY ACOUSTIC STIMULI FROM THE CEREBRAL CORTEX OF THE CAT AND THEIR CHANGES UNDER HYPOXIA (PERVICHNYE POTENTSIALY KORY GOLOVNOGO MOZGA KOSHKI NA ZVUKOVYE STIMULY I IKH IZMENENIIA PRI GIPOOKSII).

E. V. Bondarev (S. M. Kirov Mil. Med. Acad., Dept. of Aviation Med., Elec-trophysiol. Lab., Leningrad, USSR).
Fiziologicheskiy Zhurnal SSSR, vol. 50, Jul. 1964, p. 779-783. 10 refs.

In Russian.

Experiments were conducted on cats with electrodes permanently implanted into the auditory centers and above the motor centers of the brain. The animals were kept in airtight, soundproof boxes in which the barometric pressure was simulated to correspond to various altitudes. The results showed the following: (1) Changes in primary response of the auditory centers began to be evident at elevation of 5,000 m., and increased considerably above 8,000 m. (2) Other factors being equal, hypoxia produced a disturbance in the response to acoustic stimuli above 6,000 c.p.s. (3) These effects on the changes in potentials were also observed during sleep and under anesthesia. They indicate suppression of auditory center activity by hypoxia.

A64-81084

THE SPECTRAL EVIDENCE OF THE EXISTENCE OF SNOW IN THE MARTIAN ATMOSPHERE.

N. A. Kozyrev.

IN: LIFE SCIENCES AND SPACE RESEARCH. II.

Edited by M. Florkin and A. Dollfus.

Amsterdam, North-Holland Publishing Co., 1964, p. 250.

It is known that on short wavelengths ($\lambda < 4200 \text{ \AA}$) the Martian disk does not show any details except polar caps. The natural conclusion is that the Martian atmosphere is opaque at these wavelengths and the the polar caps are essentially atmospheric formations. This conclusion is confirmed by a comparative study of the Martian "continents" and "seas". From the comparison of the brightnesses of the eastern and western limbs of the Martian disk, the curve of reflectivity of particles suspended in the Martian atmosphere was specified. The pronounced scattering band was found to be similar to that found in the spectrum of fine dry snow screened before the spectrograph slit. The existence of this spectral band of snow is connected not with the size of the particles but with their physical properties. The spectrum of light passed through an ice block showed an absorption band in the same spectral region. Possibly in the Martian atmosphere are suspended fine needles like those observed in the northern regions of the earth on days of hard frost.

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